JUNE 1951

FOUNDRY

POST-CONVENTION ISSUE

. LATE BULLETINS FROM WASHINGTON (p.33) .....

... BUFFALO CONVENTION REPORT....

....NEWS ROUND-UP FROM DETROIT,

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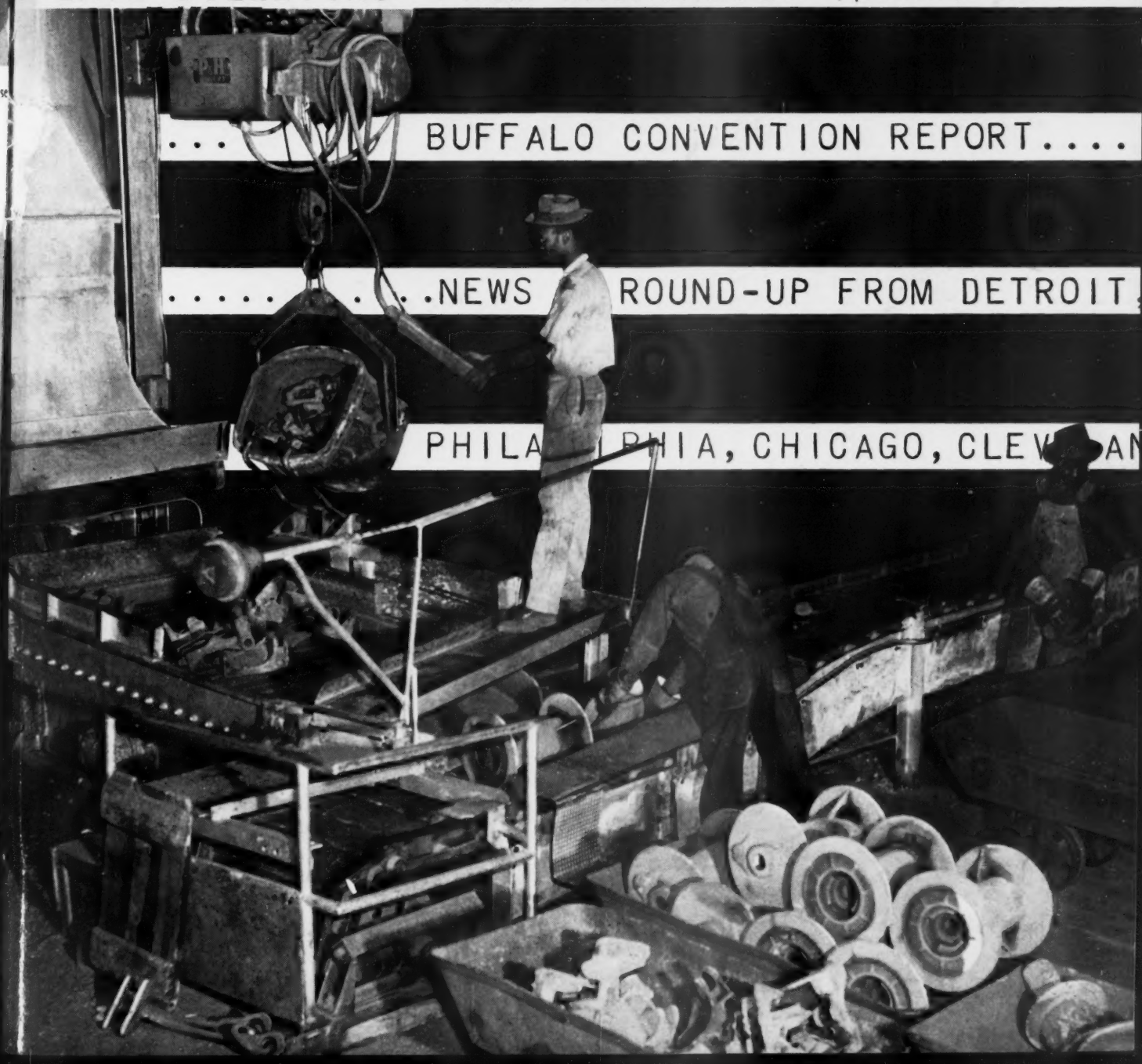

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St. Louis Plant of American Car and Foundry Company

where quality castings are made for modern heavy railroad equipment.

To produce the best castings possible, leading foundries like the American Car and Foundry Company refine their iron with Purite. Applicable both as a cupola flux and as a ladle desulphurizing agent, Purite has won industry-wide acceptance because:

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These advantages and many more, proved through its everyday use in iron foundries, have made Purite the universal cupola flux and ladle desulphurizing agent.

A new booklet, "Refining and Desulphurizing Cupola Iron," illustrates in detail the accepted ways in which Purite is most effective. Write for your copy today. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

PURITE — 100% Fused Soda Ash. The Scientific Flux for Better Melting and Cleaner Iron.

PURITE — is sold by all leading foundry supply houses in the United States and Canada.

Mathieson
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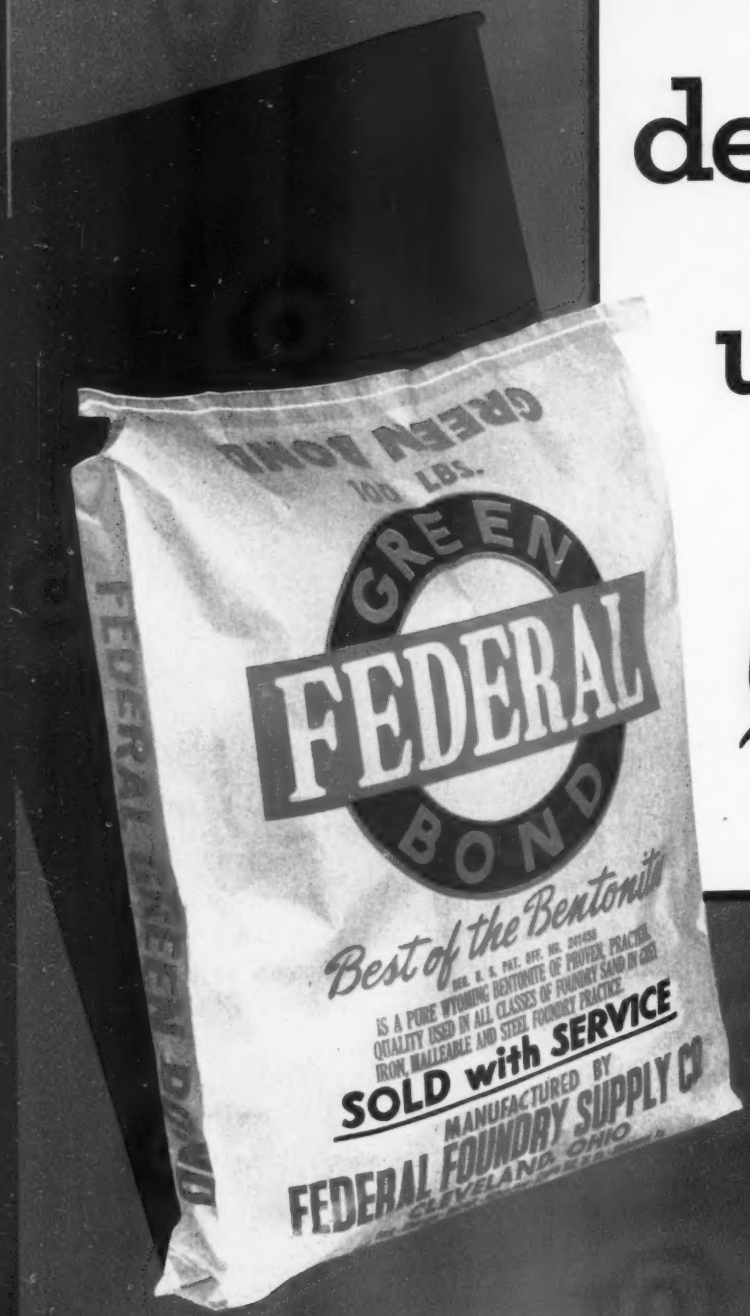
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IS A PURE WYOMING BENTONITE OF PROVEN, PRACTICAL QUALITY USED IN ALL CLASSES OF FOUNDRY SAND IN GREY IRON, MALLEABLE AND STEEL FOUNDRY PRACTICE.
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The finest Wyoming Bentonite —dependable, uniform quality—that's why foundrymen prefer Federal Green Bond. And that's why they get cleaner castings, fewer rejects and consistently better work.

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JUNE 1951

FOUNDRY

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Plenty of LINOIL for Everyone

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Immediate Overnight Delivery from Any One of 27 ADM Warehouses

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New customers and old customers alike share in ADM's special delivery service. If you need core oil "IN A HURRY", just wire or call collect the *LINOIL* warehouse nearest you, or call Cleveland, and a shipment will be made the same day.

CHECK YOUR NEEDS WITH A LINOIL MAN—

There's an experienced Linoil man in every foundry center in the United States and Canada. Call on him at any time—he'll help you plan your future requirements. If you have a core room problem, ask him about ADM's Sand Research Laboratory—it's a free service.

There are three LINOIL producing plants, any one of which is capable of supplying the entire foundry industry with the highest quality core oil.

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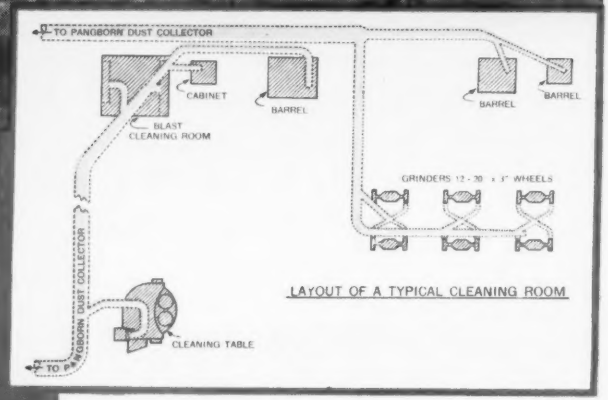
Pangborn engineers combined two dust collectors in this one compact installation to solve an abrasive dust problem. See story below for details.



Most cleaning rooms are a source of dust. Note this room contains 18 dust-producing pieces of equipment!

DUST OFF YOUR FOUNDRY

It's good business to keep DUST AWAY FROM MEN AND MACHINERY with Pangborn Dust Control

FOUNDRY DUST is abrasive dust and nothing can raise more havoc with production. Take a look at this typical cleaning room setup (based on an actual installation). Every piece of equipment is a potential dust maker . . . from the abrasive grinding wheels to the blast cleaning room.

To check dust *before* it damaged valuable equipment, Pangborn engineers combined two efficient type "CH" Dust Collectors in one outside unit. Then dust from all cleaning equipment was trapped by properly designed piping . . . and abrasive dust from the grinding wheels was controlled by efficient hoods.

As a result, this foundry is a comfortable place to work. With Pangborn Dust Control on the job, walls stay cleaner longer. Windows require less washing. Working areas are well lighted. Both men and machines *turn out more work* per day!

GET RID OF COSTLY DUST in your plant. Besides being a nuisance, foundry dust is downright dangerous to men, machinery and production. To find out how you can *stop dust at a profit,* write for Bulletin 909A to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn DUST CONTROL

STOPS THE DUST HOG from stealing profits

ADVERTISEMENT

If you haven't heard it . . .

IT'S NEWS!

TOO MANY PEOPLE nowadays stop looking for work when they get a job.

* * *

WE NOMINATE FOR TOP HONORS as a diplomat the man who can convince his wife that all the new styles make her look fat.

* * *

ONE OF THE FIRST CASUALTIES of the production speed-up: in Massachusetts a red hen laid a record 8.5-ounce egg, then died.

* * *

AFTER FOUR YEARS OF SURVEY and study, the U. of Michigan's Institute of Social Research reports that the man who whistles at his work may be happy, but he's a poor producer.

* * *

SPEAKING OF PRODUCING—a subject of major interest to all of us these days—perhaps you have already learned the hard way that a cleaning room bottleneck (pickling, tumbling, outmoded blast machines) can quickly nullify the speed-up you're getting with modern equipment in other departments.

* * *

FORTUNATELY, there's a solution to your problem no farther away than the nearest mailbox. Pangborn ROTOBLAST is the world's champion cleaning room bottleneck unplugger and users report it pays for itself in no time. Write today for details.

* * *

FRIEND OF OURS back home writes that the best way he knows of to "save face" is to keep the lower end of it closed.

* * *

THEN THERE IS THE FELLOW who stepped on the scales and wouldn't admit he was overweight—only that, according to the height-weight table printed on the front, he ought to be six inches taller.

* * *

NOW WE CAN ALL BREATHE EASIER: Scientists of the Smithsonian Institute report that nobody has ever been struck by a meteorite.

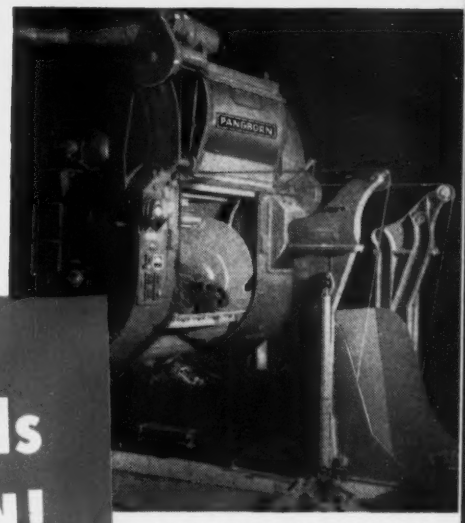
* * *

WITH THE HIGH COST of lumber and the greatly reduced purchasing power of the 5c piece, it might be a good idea to take all the wooden nickels you can get.

* * *

PUSH-BUTTON CLEANING!

MECHANIZED LOADING!



SIMPLIFIED UNLOADING!

Here's How Pangborn ROTOBLAST* Barrels SPEED DEFENSE PRODUCTION!

SPEED is essential to defense production . . . and in case after case, Pangborn ROTOBLAST Barrels have proved they can clean castings up to 24 times faster than conventional equipment. Even loading is fast! With Pangborn automatic loading equipment, any size ROTOBLAST Barrel (from 3½ to 28 cubic feet) can be loaded *in one minute or less!*

What's more, Pangborn ROTOBLAST Barrels assure high-quality cleaning. The exclusive "rocking" action of the Barrel exposes all surfaces to the blast stream . . . makes sure pockets of intricate pieces are completely cleaned. And ROTOBLAST Barrels cost less to operate. Horsepower requirements average 87% less, smaller crews are needed and automatic abrasive recovery assures maximum economy.

FOR FASTER BLAST CLEANING install Pangborn ROTOBLAST Barrels in your cleaning room. Bulletin 213 gives you full details, specifications and actual performance as reported by users. Write today to: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment.

These action photographs prove Pangborn ROTOBLAST Barrels are *easy to operate*. This 14′ ROTOBLAST Barrel is shown in use at the Frick Company. It speeds cleaning by replacing four old-style machines and a secondary pickling operation. And with this machine two men can clean half the entire foundry's output—at an annual saving of $2540.00 on labor!

ROTOBLAST . . .

SAVES LABOR with push-button operation

SAVES SPACE because machines are compact

SAVES TIME by cleaning more loads per day

SAVES POWER since no compressor is needed

SAVES TOOLS because all scale is removed

FOUNDRY EQUIPMENT MEMBER FEMA MANUFACTURERS ASSOCIATION, INC.

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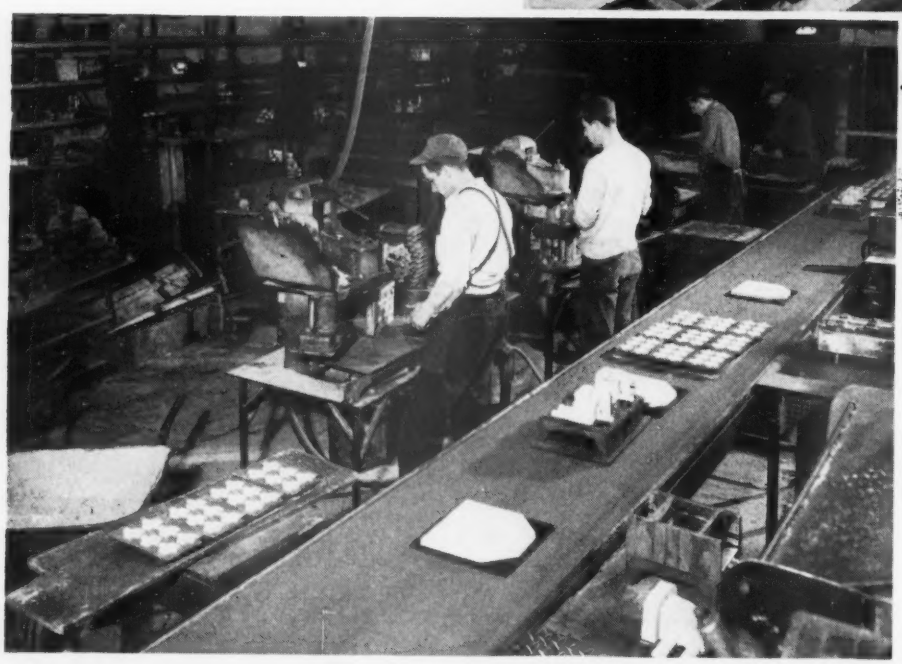
BLAST CLEANS CHEAPER

with the right equipment for every job

*Trademark of the Pangborn Corporation

Again it's Champion

The five CB-10 Champions, at Midwest Foundry Co.



Two of the three CB-5 "Juniors."

We're "ready, able and willing to aid you in making the Champion method work for you, to cut costs, improve working conditions, and turn out better castings from better cores. Let our engineers show you how easy it is to join the huge family of satisfied users.

FOUNDRY AFTER FOUNDRY TELLS THE SAME STORY —IT MUST BE TRUE!

FOR "EFFICIENT AND ECONOMICAL CORE ROOM OPERATION"

From the CB5 and CB10, the Champion line runs on up to the massive CB400, including six sizes that will meet the widest range of core requirements. The largest as well as the smallest core can be blown in the same split second, with the same "flick of the wrist" operation. For more cores, more accurate cores, per shift, shift to Champion!

Now comes a letter from Midwest Foundry Company, Coldwater, Michigan, reporting what any foundry, large or small, finds true about Champion performance:

March 27, 1951

Champion Foundry & Machine Company
1553 West Madison Street
Chicago 7, Illinois.

Gentlemen:

We have just recently completed installation of our fifth CB-10 and our third CB-5 Champion core blowers. We are now completely standardized in the core room with Champions.

These machines at the present time are operated 24 hours per day, 6 days per week, and we have yet to have a mechanical failure. The machines are fast and easy to operate which, of course, makes them economical.

We would not hesitate recommending Champion core blowers to any foundry desiring an efficient and economical core room operation.

Sincerely,

MIDWEST FOUNDRY COMPANY

JEW
fc

John E. Wolf

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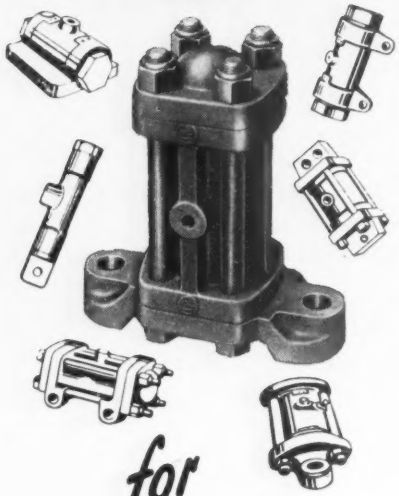
MOLDING MACHINES CORE BLOWERS THE ELECTRIC RIDDLE

AIR VIBRATORS



for Foundry Operations

Foundry-engineered for a wide range of applications, SPO air vibrators feature full-power starting, high-speed operation, low air consumption, and a long trouble-free service life.

These dependable, low-cost vibrators have repeatedly proven their ability to withstand continual hard usage and still perform with maximum efficiency. Operating on standard line pressures, powerful SPO vibrators increase the production capacity of molding machines, facilitate removal of matchplate patterns from sand molds, perform shake-out operations, and assure a steady flow of granular materials from hoppers, bins, and chutes.

Seven different types of SPO vibrators are available from stock in a range of sizes to meet every foundry vibration need.

For complete information, write today for BULLETIN 50.

New BULLETIN 50 contains data and specifications on standard line of SPO air vibrators.

SPO

INCORPORATED

6449 GRAND DIVISION AVE., CLEVELAND 25, OHIO

With the EDITORS

CONVENTION: Looking back at an interesting week in Buffalo, FOUNDRY editors and business representatives agree that the 1951 convention of the AFS was perhaps the best nonexhibit meeting ever staged by the society. All of us came away with the feeling that interest in the technical sessions, shop courses and management meetings was more intense than at some previous gatherings. It was apparent that foundrymen well realize the tremendous task facing the industry in meeting the challenge of defense production in the face of shortages of materials and men, and that they are bending every effort to meet this challenge.

—o—

Good To See You: All of us enjoyed greatly meeting so many friends in the industry. Of course we are looking forward to seeing you again in the not too distant future, either at other foundry industry meetings or on the home grounds. And before we know it, May 1, 1952 will roll around and we will be off to Atlantic City for the great International Convention and Exhibition.

—o—

Birthday: Congratulations to Beardsley & Piper Division on the silver anniversary issue of its house organ *Better Methods.* Here at FOUNDRY we have a number of old timers who remember the first issue which appeared in April, 1926 and described the Nash plant at Kenosha, Wis. We surely agree with the editor of that publication on his comment on the condition of the industry today as compared with 25 years ago:

"Today the average foundry is a far better place in which to work than in 1926. The productive efficiency of foundries has also been immeasurably improved, and great strides are still being made and will be made in the future. As this Silver Anniversary Issue goes to press the foundry industry is in a much better position than ever before to perform its important job."

—o—

More Congratulations: This time to Claude B. Schneible of Detroit for the excellence of his annual report as president of the Foundry Educational Foundation. Progress of that organization since its incorporation in 1947 is outlined. Statistics are well presented in chart form, and photographs of officers, trustees and advisory committee chairmen are included. FOUNDRY believes the present work of FEF will continue to benefit the foundry industry for years to come.

—o—

Lost and Found: Anybody lost a gray iron pulley casting? We had a call the other day from a local citizen who is seeking the owner of an unmachined pulley he found on one of Cleveland's west side streets. He thought the piece probably had dropped off a truck while in transit. Our caller estimated the casting's weight at 75 pounds and said it was stamped QC-675. This sounded like a natural for Quality Castings Co., Orrville, O., but they disclaim ownership. Any takers?

—o—

What is an Engineer?: One of our young readers, a recent graduate, has passed along the following definition of an engineer: An engineer is a person who passes as an exacting expert on the basis of being able to turn out with prolific fortitude infinite strings of incomprehensible formulae calculated with micromatic precision from vague assumptions which are based on debatable figures taken from inconclusive experiments carried out with instruments of problematical accuracy by persons of doubtful reliability and questionable mentality for the avowed purpose of annoying and confounding a hopeless chimerical group of fanatics referred to all too frequently as engineers.

We would like to give credit to the author of this literary effort, but our correspondent was unable to supply information as to the source.

—o—

First Iron Works: We recently received Vol. 1, No. 1 of the *Gazette,* an eight-page folder published in the interest of the First Iron Works Association of Saugus, Mass. The project of that organization is the restoration of "America's' first successfully operated iron works" and announcement is made in the *Gazette* that the work will begin shortly, provided building materials are available. Since the first casting produced in the United States was poured at Saugus, foundrymen will be interested in the progress being made. According to the *Gazette,* foundations of several of the original buildings have been un-

(*Concluded on page* 12)

THREE CENTS!

That's all it costs to hire this practical foundry specialist!

● A three-cent stamp—that's all it takes to get the years of practical experience and extensive technical knowledge of the Republic Pig Iron Metallurgist, the man who is paid by Republic to work for you, the pig iron user.

If it's a particular production problem on which you need prompt assistance, you can depend on help in a hurry from the Republic Pig Iron Metallurgist. Or if it's a less urgent matter—even a routine survey of the molding practices which you are using—you can count on him to pay you a visit the next time he's in your neighborhood.

The cost? Outside of your original three-cent stamp, not one penny! The only obligation is his—and it is to help you. Drop us a line today . . . let us know when you would like him to call.

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GENERAL OFFICES • CLEVELAND 1, OHIO
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Republic **PIG IRON**

"CHATEAUGAY" Low-Phosphorus, Copper-Free

"REPUBLIC" (Northern) Foundry, Basic and Malleable

"PIONEER" (Southern) Foundry and Basic

REPUBLIC STEEL

"Sitting Pretty"

Everyday's a holiday from grinding problems since he put Simonds Abrasive Company wheels to work. More production . . . fewer wheel dressings . . . and DO's out ahead of schedule. Why? Because all Simonds wheels are accurately specified . . . rigidly tested . . . and scientifically controlled in manufacture. Complete line includes grinding wheels, mounted wheels and points, segments and abrasive grain . . . all backed by Simonds' more than 50 years experience as a major manufacturer of grinding wheels. Write for free Data Book.

SIMONDS ABRASIVE CO.
grinding wheels

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(*Concluded from page* 10)

covered, as well as several timbers which formed part of the base of the bellows of the blast furnaces. Excavations have brought to the surface more than 3 tons of authentic relics. These include iron rings, nails, tools, gears, kitchen utensils and a 505-lb hammer head used at the forge of the iron works.

—o—

The Chef: And what is so rare as a day in June? Perhaps it may be the male who longs to demonstrate his abilities as a cook when early summer brings the urge for a picnic. Whether it be in the back yard, at the picnic grounds, or at the cottage on the shore of the ocean or lake, the longing to broil a steak or to try a hand at a batch of pancakes appears irresistible to many of the so-called stronger sex. After much research and study, we are fortunate in being able to reproduce a photograph of one who considers himself an expert in the outdoor culinary art. The photo was made by Ruedi Homberger,

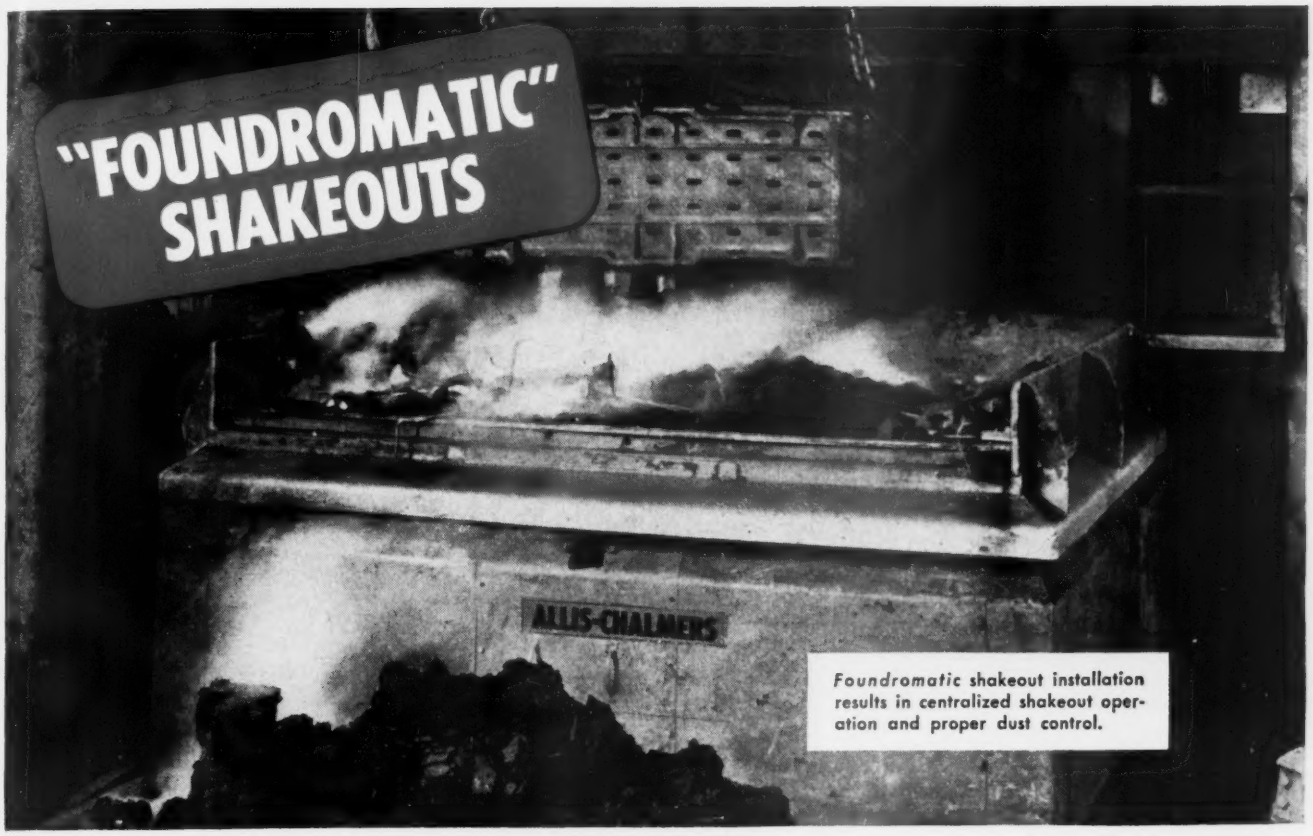
George Fisher Ltd., Schaffhausen, Switzerland, and is reproduced through his kind co-operation. Of course you have already guessed that our famous chef is none other than Otto Pfaff of American Wheelabrator & Equipment Corp., and the locale is the Pfaff cottage on the shore of Diamond Lake, Mich.

—o—

Cover: Some of the boys in the business department have been telling us that we miss a bet by not blowing our horn about the news-reporting facilities of FOUNDRY. With 25 or more pages of strictly foundry industry news each month, we do try to keep you posted. So this month we have featured the news angle on our front cover. The photograph is from Texas Foundries Inc., Lufkin, Tex., which is described on page 110.

All of this conversation on news reminds us to ask how long it has been since YOU sent us a news release on a personal item on yourself or your associates? We would appreciate having this information.

F.G.S



Foundromatic shakeout installation results in centralized shakeout operation and proper dust control.

Clean Up Your Foundry!

With old shakeout methods, valuable floor space was used for molding sand and no dust control was possible. Alloy steel casting seen here being dumped directly onto the foundry floor.

IMPROVED WORKING CONDITIONS resulted when a *Foundromatic* shakeout was installed at this large western foundry. (Company name will be furnished upon request.)

Look at the photo in the column at left, showing a flask being shaken out by the old method formerly used at this foundry. Compare it with the photo above, showing the same operation on the 8 x 10 ft, 25 ton capacity *Foundromatic* shakeout at this foundry.

The company is so satisfied they also have installed *Foundromatic* shakeouts at their Chicago Heights, Denver and St. Louis foundries. Is *your* foundry still using slow, dusty methods of shaking out flasks? Consider the improved working conditions and other benefits a *Foundromatic* shakeout installation will bring:

INCREASED OUTPUT — Shakeout can break up molds as soon as castings are cool, leaving floor area free for reuse. Better working conditions improve efficiency.

LOWER COST — Man-hours for shakeout or core knockout operations are radically reduced, using the same *Foundromatic* shakeout. Flask maintenance minimized. Heavy duty stress-relieved body, with oversize bearings in vibrating mechanism, gives long service. Hourly cost of operation is low.

Foundromatic shakeout single units range in capacity from one ton to 25 tons . . . multiple units available for over 100 tons. Call your nearest A-C sales office for information, or write to Allis-Chalmers, Milwaukee 1, Wis. for Bulletins 07B7532, up to 5,000 lb, or 07B6365A, up to 25 tons. A-3394

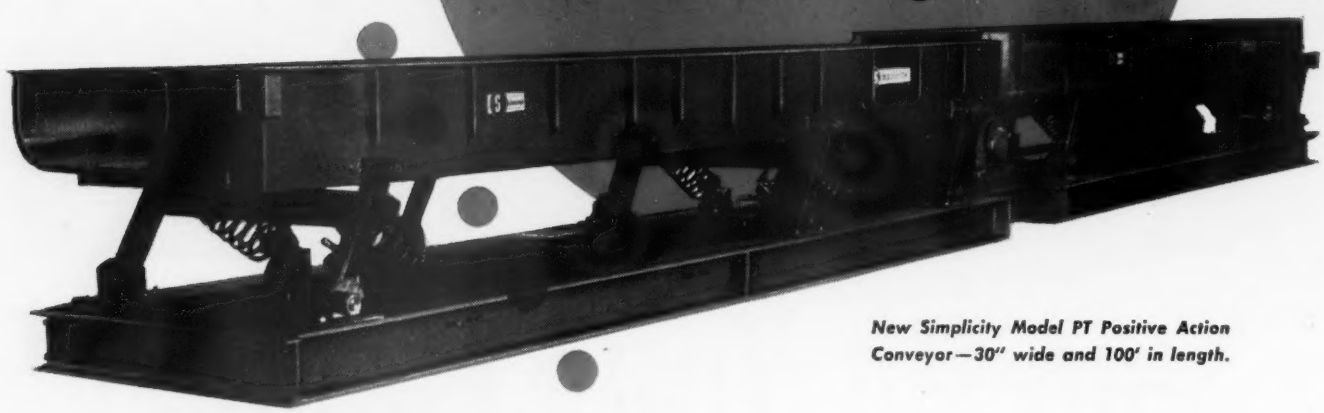
ALLIS-CHALMERS

Foundromatic and *Regulex* are Allis-Chalmers trademarks.

Foundry Equipment for Bigger Output-Better Working Conditions!

VIBRATING SCREENS | CUPOLA BLOWERS | MOTORS-DRIVES CONTROL | FOUNDROMATIC CORE DRYER | INDUCTION HEATING & MELTING | REGULEX ARC FURNACE CONTROL

Simplicity conveyors cut the "high cost of handling" hot sand and castings...



New Simplicity Model PT Positive Action Conveyor—30" wide and 100' in length.

30" x 14' Simplicity Os-A-Veyor Type Conveyor handling hot castings at big automotive production foundry.

If you're spending too much money on maintenance and equipment repairs for handling hot sand and abrasive castings, it's time to cut costs with either a Simplicity Os-A-Veyor (Oscillating Type Conveyor) or a Model PT Positive Action Conveyor. Simplicity Conveyors are ruggedly built for tough foundry duty. Simple power units and operating mechanism mean *easy servicing and low maintenance costs* under the roughest operating conditions.

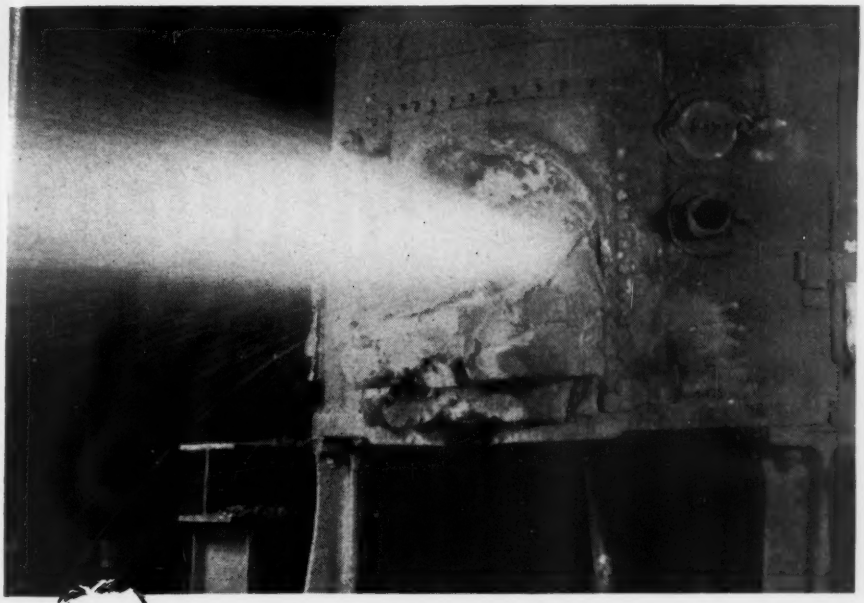
Model PT conveyors, built in lengths of 100', can be installed in multiples to meet any level-operation casting or sand handling requirement. Os-A-Veyor types, available in lengths to 30' and widths from 12" to 6', will operate on incline with capacity governed by depth of bed. Simplicity Conveyors give positive rate of feed and are ideally suited for handling hot, abrasive materials *without damage.* You can cut your high cost of handling hot sand and castings in your foundry with Simplicity Conveyors. *A Simplicity engineer will be glad to give you the full story.* Write, wire or phone us today.

88

- **Sales Representatives In All Part Of The U.S.A.**
- **For Canada:** Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario
- **For Export:** Brown & Sites, 90 Church Street, New York 7, N. Y.

Simplicity
TRADE MARK REGISTERED

ENGINEERING CO., DURAND, MICHIGAN



INCREASED PRODUCTION per hour results from the fewer interruptions per campaign you get with Norton Crystolon* (silicon carbide) slag hole blocks, which resist slag action 5 to 15 times longer than fire clay blocks.

NOW . . . FEWER INTERRUPTIONS PER CAMPAIGN

If short-lived slag hole blocks are cutting down your production per hour you are *needlessly* wasting productive capacity. For, Norton Crystolon slag hole blocks consistently hold their hole size from 8 to 30 hours . . . depending on the type of cupola and the composition of your slag.

Made of hard, dense silicon carbide, Norton Crystolon blocks stubbornly resist slag erosion and corrosion at temperatures as high as 3050°F. More and more foundries report that no other blocks they have used last so long without softening, spalling or cracking.

Worth Comparing!

Give Norton Crystolon slag hole blocks a workout in your cupolas. Compare their performance with whatever you are now using. Maybe you, too, will reduce costly shutdowns and speed up the flow of vitally needed metals. For prices or more information, contact your nearby Norton representative or write us direct. Norton Company, Worcester 6, Massachusetts.

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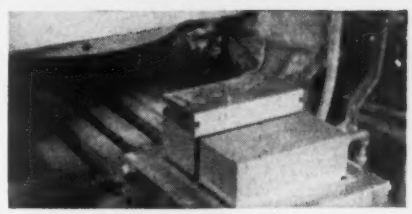
A. P. GREEN FIRE BRICK CO., Ltd. TORONTO, ONTARIO

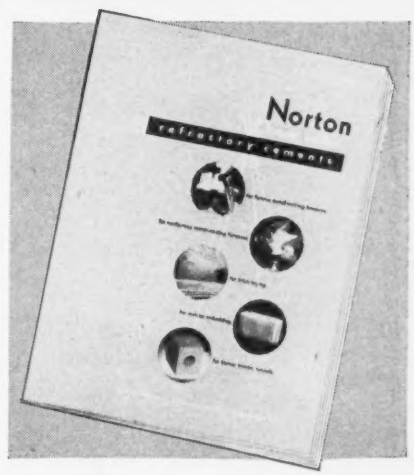
How to Select The Right Refractory Cement:

FOR TROWELING

FOR RAMMING



FOR PRESSING



Write for Bulletin 863

. . . "the most helpful bulletin on refractory cements ever published" according to the hundreds of foundry and furnace men who are using its selection charts and installation directions. Write for your copy today.

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Profits Multiply..

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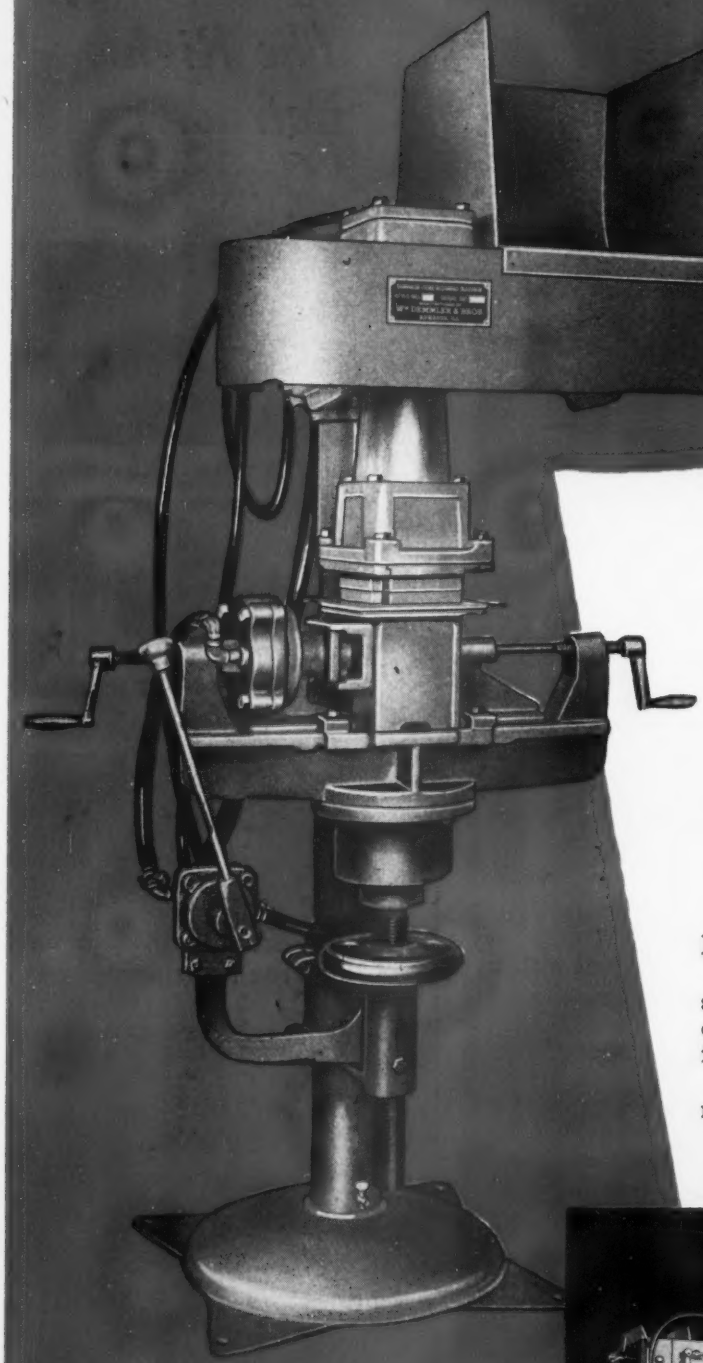
DEMMLER

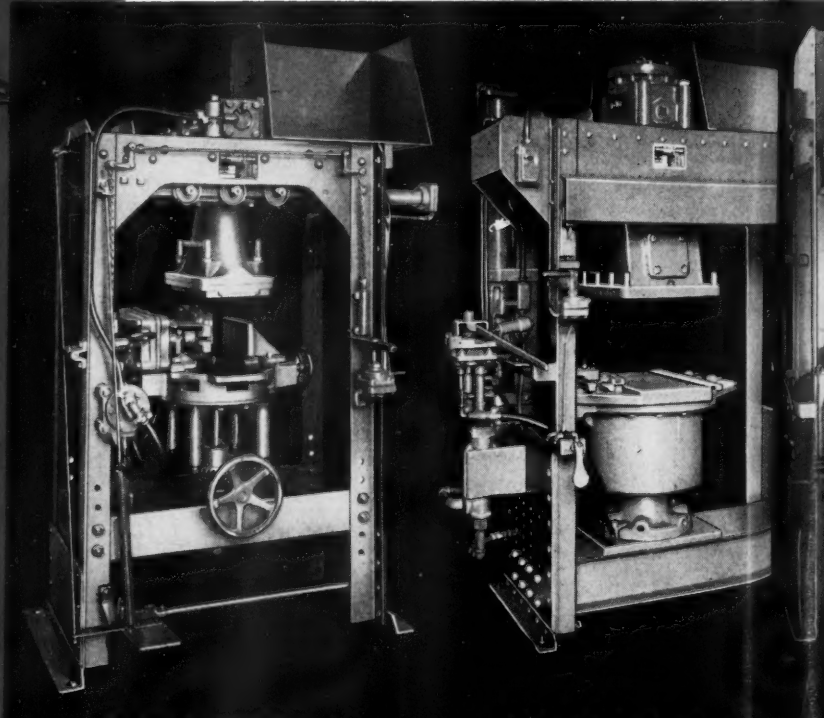
Since 1911, efficient DEMMLER Core Blowers have been making money for foundries large and small.

Their reputation for dependable — trouble-free service, coupled with their ability to produce high quality cores faster at less cost has made them a favorite everywhere!

The DEMMLER line is a complete line. There is a machine to meet every core blowing requirement.



DEMMLER
NO. 55



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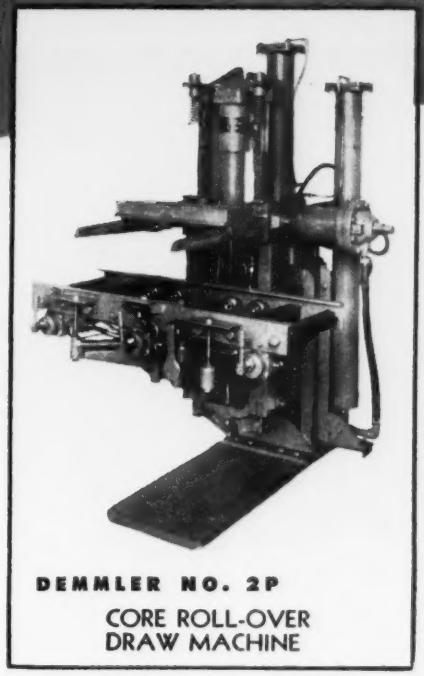
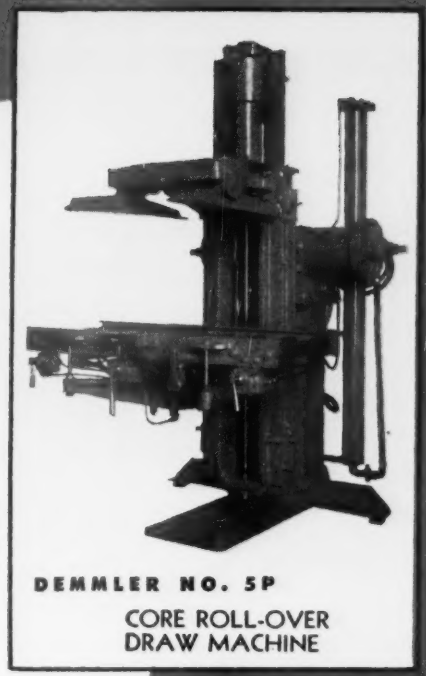
DEMMLER NO. 3E



DEMMLER NO. 2P
CORE ROLL-OVER
DRAW MACHINE



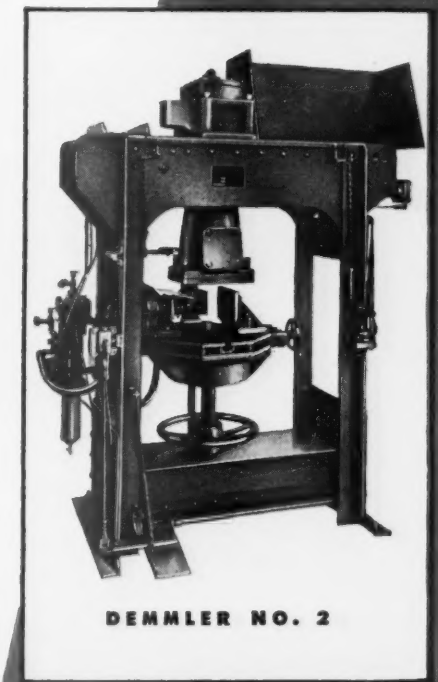
DEMMLER NO. 5P
CORE ROLL-OVER
DRAW MACHINE

Core Blowers

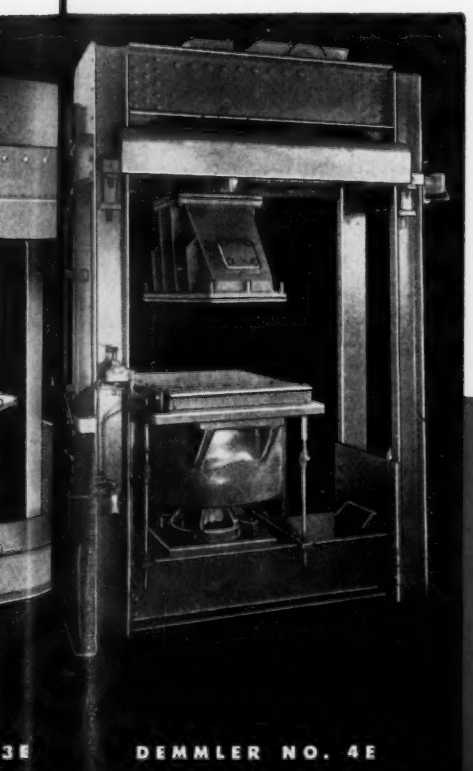
Each machine features both horizontal and vertical adjustments for quick, easy job changes.

Why not join the thousands who depend upon DEMMLER Core Blowers to assure them greater profits through an efficiency that sets the standards for the industry?

Descriptive literature on any of the machines illustrated will be sent on request. Write for yours TODAY!



DEMMLER NO. 2



DEMMLER NO. 4E

Wm. DEMMLER & Bros
Kewanee, Illinois

LET'S SCRAP THIS SCRAP PILE!

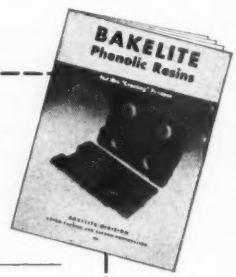
When you use the Croning Process for making *thin-shell* sand molds and cores bonded with BAKELITE Phenolic Resins, your metal scrap pile will be smaller. Why?

- You get castings of extremely close tolerances—as close as .002 to .005 of an inch per inch—requiring considerably less removal of excess metal.
- You get castings of well-nigh pattern-smooth surfaces that need little or no finishing.
- You get molds and cores of uniform quality, reducing rejects of castings.

The "C" Process brings you other notable advantages over usual sandbox methods. These are:

- 90 per cent less sand required.
- Fast mold and core production.
- Molds and cores are strong, moisture-resistant, stable, can be stored for long periods.
- Much floor space is saved.

For information about BAKELITE Phenolic Resins for the "C" Process, to conserve metal and lower foundry costs, use the attached coupon.



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30 East 42nd Street, New York 17, N. Y.

Please mail at once my free copy of the booklet, "BAKELITE Phenolic Resins for the Croning Process."

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PHENOLIC
BONDING RESINS
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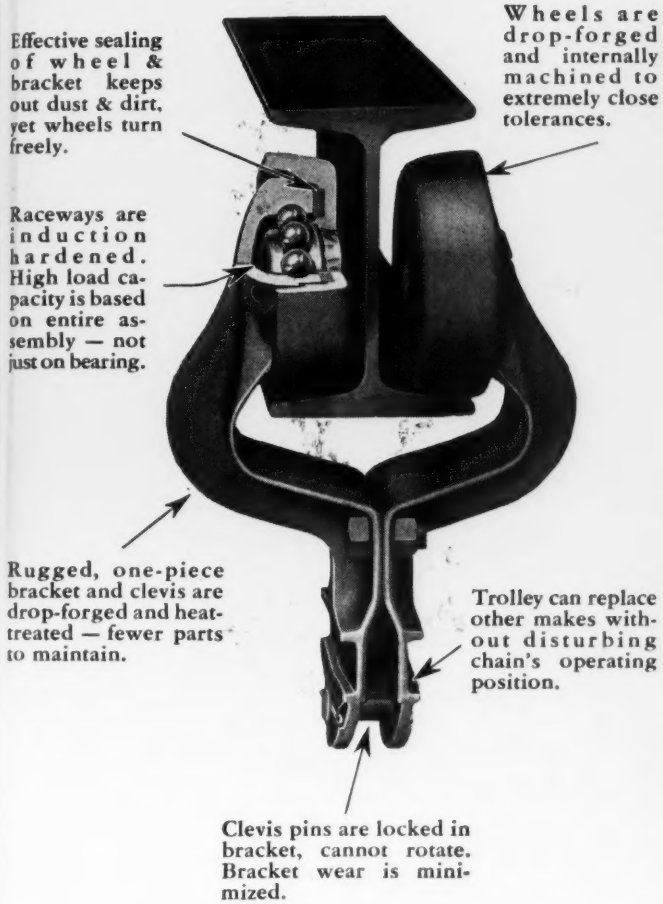
When you buy TROLLEY CONVEYORS why not get BOTH?

Superior components PLUS Engineering ingenuity


Effective sealing of wheel & bracket keeps out dust & dirt, yet wheels turn freely.
Wheels are drop-forged and internally machined to extremely close tolerances.
Raceways are induction hardened. High load capacity is based on entire assembly — not just on bearing.
Rugged, one-piece bracket and clevis are drop-forged and heat-treated — fewer parts to maintain.
Trolley can replace other makes without disturbing chain's operating position.
Clevis pins are locked in bracket, cannot rotate. Bracket wear is minimized.

High capacity in compact space is provided by 330-ft. overhead trolley mold conveyor, part of complete Link-Belt installation at Wagner Malleable Iron Company, Decatur, Ill. Platform conveyor on which pourer stands is synchronized with mold conveyor.

Note rugged construction of chain, hanger and one-piece bracket and clevis attachment of 285-ft. Link-Belt overhead castings collecting conveyor at Wagner.

You can make your overhead trolley conveyor dollars go farther by calling in Link-Belt while you're still in the planning stage. Link-Belt makes the finest trolley on the market today. Equally important, our specialists can draw on the world's largest, most varied background of conveying and power transmission application.

Pouring molds on the run. Handling castings smoothly from shakeout to shipping. Transporting cores to foundry operation. Dumping sprues automatically at discharge points.

Link-Belt Overhead Trolley Conveyors do all these jobs to release valuable manpower for productive work . . . to increase output. And they free floor space, too.

Why not have a Link-Belt foundry specialist help you and your consultants plan peak production results? Write for Book 2330.

LINK-BELT

OVERHEAD TROLLEY CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,344

mechanize your manpower

Take the shovel out of a man's hand and put him on the seat of a PAYLOADER. He'll show you how to lick rising costs, how to increase output and solve manpower shortages. Hundreds of foundries and metal working plants have taken this step with highly gratifying results. And PAYLOADERS can do so many jobs that there is hardly any limit to their usefulness.

Every PAYLOADER is a complete Hough-built tractor-shovel specifically designed with multiple reverse speeds and other features that insure fast, low-cost bulk material handling. There are several sizes from the 12 cu. ft. Model HA shown, up to 1½ cu. yd. bucket capacity. They are also available in front-wheel, rear-wheel and four-wheel-drive models.

Every PAYLOADER is backed by 30 years of material handling equipment manufacture and a Hough Distributor with complete parts and service facilities. The Frank G. Hough Co., 703 Sunnyside Avenue, Libertyville, Illinois.

On These Jobs

- Unload box cars.
- Carry sand, coke, scrap, limestone, etc., to storage.
- Transport and distribute sand to molding stations.
- Remove used sand from floors.
- Windrow sand for the cutter.
- Charge mullers, hoppers, tumbling barrels.
- Feed conveyors, elevators, mixers, screenerators.
- Clean up gangways, aisles and other areas.
- Handle coal, ashes, cinders.
- Handle scrap and small castings.
- Maintain private roadways.
- Do cranework — haul, push.
- Remove snow.

HELP for your material handling problems is found in "Industrial Handling" the free Hough magazine. Catalog on any size PAYLOADER is available, without obligation.

SAY "HUFF"

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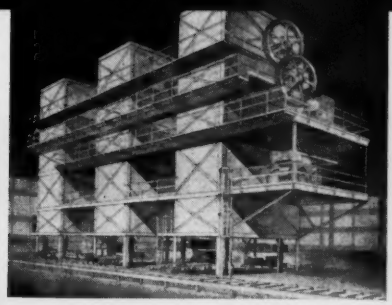
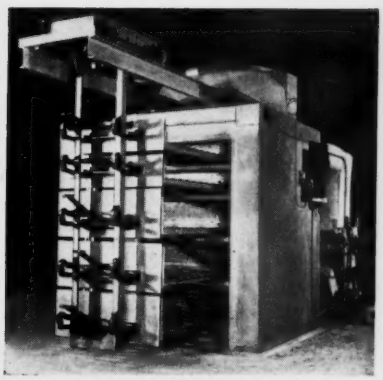
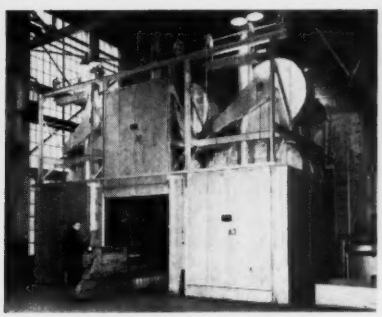
THE FRANK G. HOUGH CO. • *Since 1920*



VERTICAL CORE OVENS
at General Steel Castings Co.



ROLLING DRAWER CORE OVEN
at Aluminum Co. of America



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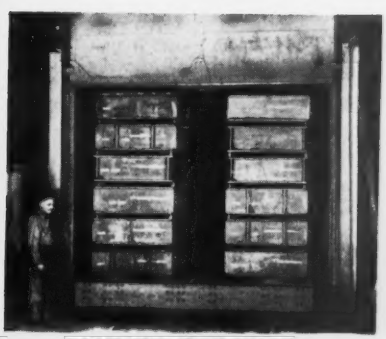
CARL-MAYER
CORE AND MOLD OVENS

Outstanding Engineering

ALSO OTHER TYPES OF INDUSTRIAL OVENS, AND FURNACES.



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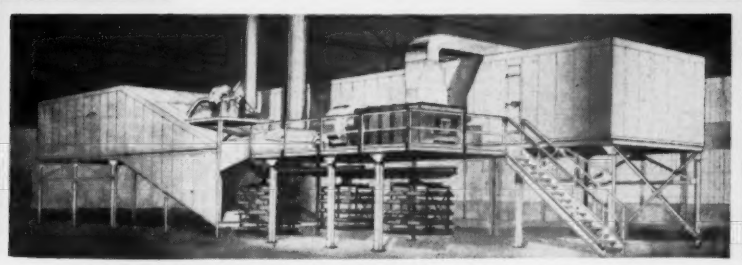

HORIZONTAL MONORAIL CORE OVEN at Eclipse Aviation Co.

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THE CARL-MAYER CORPORATION

3030 Euclid Avenue • Cleveland, Ohio

BACKED BY REPUTATION AND OVER 30 YEARS' EXPERIENCE

NEW . . .
IMPROVED

HEAVY DUTY

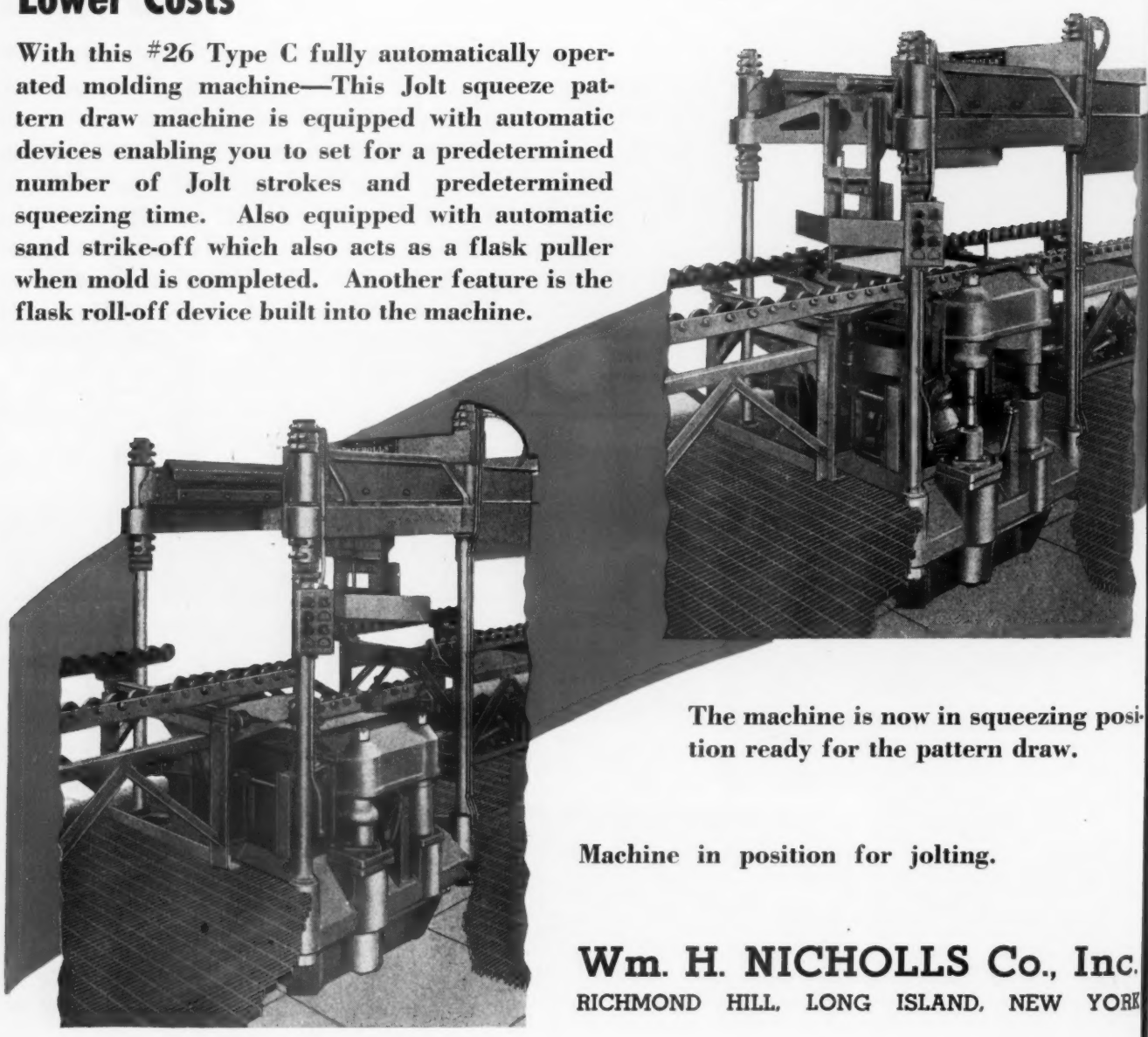
JOLT—SQUEEZE—

Equipped with "Safety

for fully automati

Increase Production . . .
Lower Costs

With this #26 Type C fully automatically operated molding machine—This Jolt squeeze pattern draw machine is equipped with automatic devices enabling you to set for a predetermined number of Jolt strokes and predetermined squeezing time. Also equipped with automatic sand strike-off which also acts as a flask puller when mold is completed. Another feature is the flask roll-off device built into the machine.



The machine is now in squeezing position ready for the pattern draw.

Machine in position for jolting.

Wm. H. NICHOLLS Co., Inc.
RICHMOND HILL, LONG ISLAND, NEW YORK

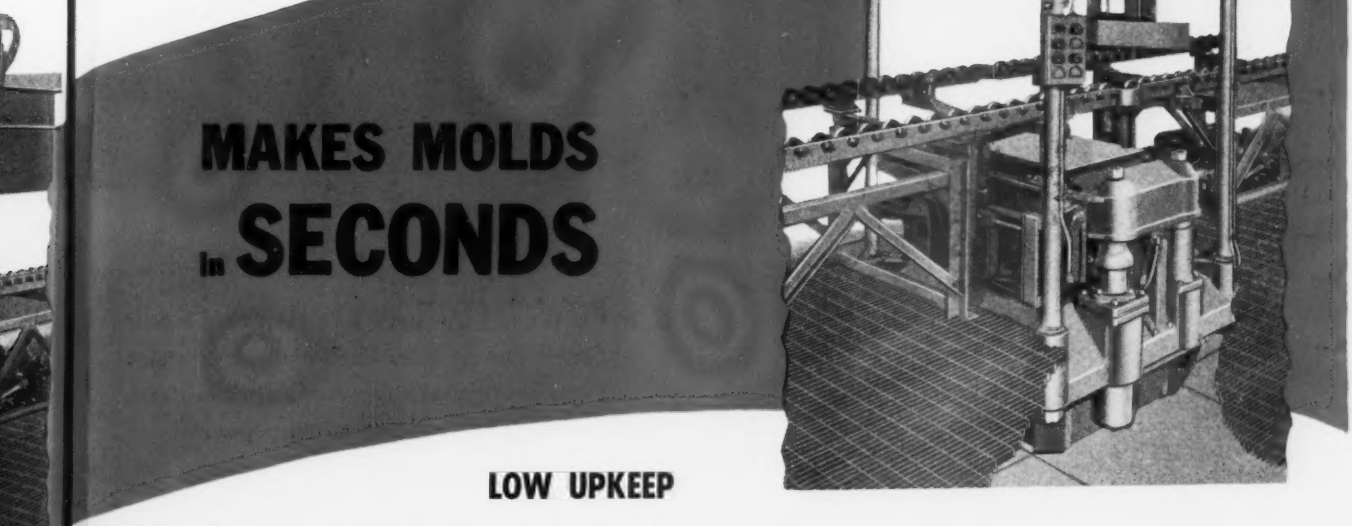
Foreign Manufacturers and Selling Agents—
For Continental Europe and Great Britain—The George Fischer Steel and Iron Works, Schaffhausen, Switzerland

TY MOLDING MACHINES

E- and PATTERN DRAW

ty Push-Button Controls

ati operation



MAKES MOLDS in SECONDS

LOW UPKEEP

All draw pins and guide bushings are case hardened and ground to precision tolerances for perfect fit and smooth operation. An accurate system of gages and jigs provides interchangeability of parts for the same models.

The low upkeep records of hundreds of foundries attest for foresight of Nicholls' Engineers in designing inbuilt features that make for long life and accurate, dependable performance after years of service. As an instance, we point to the dirtproof housings and forced lubrication that are provided for all critical parts that might otherwise wear quickly and affect permanent alignment and satisfactory operation.

The international acceptance of large numbers of Nicholls' molding machines for many years is evidence of their productive capacity, combined with low upkeep and reliability.

Write for Literature

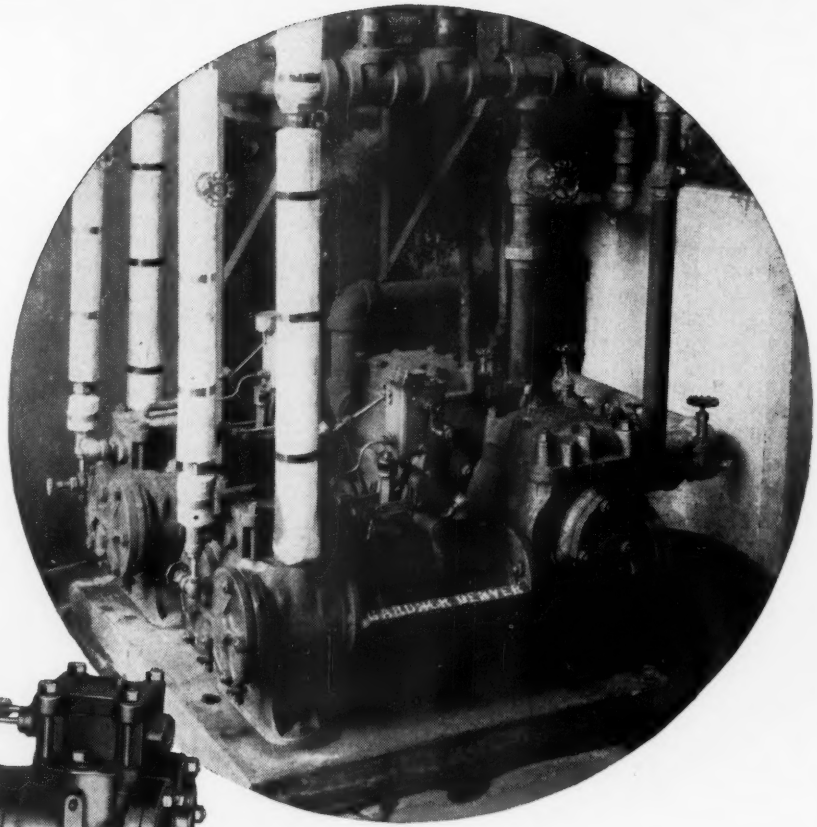
The pattern has been drawn, the pressure head returns to the out position and automatically pulls the finished mold onto the roller extension.

GUARANTEED WORKMANSHIP

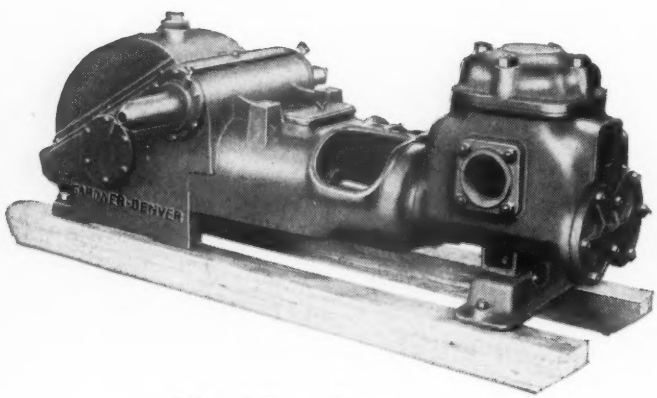
Smooth sensitive operation is built into all moving parts of Nicholls molding machines by expert mechanics, skilled in their specialized tasks. Close tolerances assured by a system of accurate jigs and fixtures.

NICHOLLS

2-Way Economy with GARDNER-DENVER Boiler Feed Pumps



5¼ x 3½ x 5 Steam Pump



3½ x 5 Power Pump

1. POWER ECONOMY! Gardner-Denver Steam Pumps have short and direct steam ports for greatest steam economy. The steam valves stay tight at all steam pressures.

Gardner-Denver Power Pumps are equipped with friction-defying Timken tapered roller main bearings. Herringbone gears and large eccentric bearings transmit more of the power into useful pumping.

2. IN THE SIZE YOU NEED! Gardner-Denver Boiler Feed Pumps are manufactured in a wide range of sizes, for any type of drive. Our pumping experts will gladly help you select just the right combination for maximum economy in your plant.

Write us today for further information.

SINCE 1859

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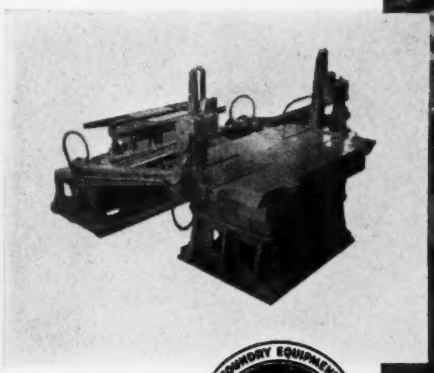
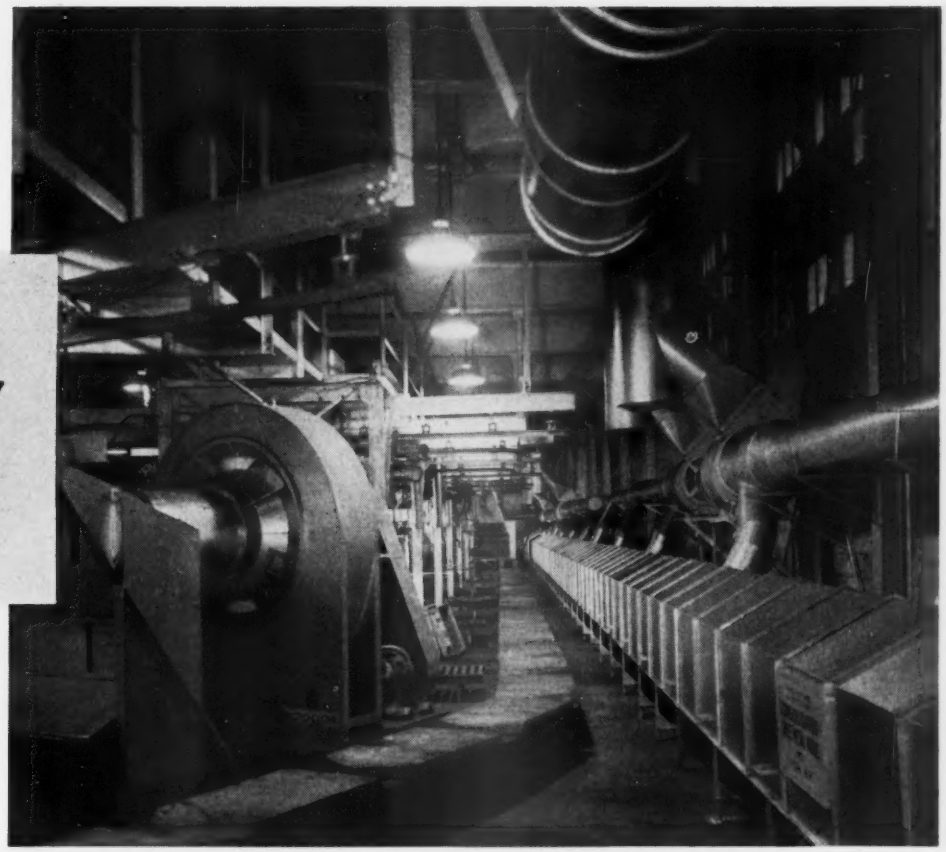
International Heater Company





This Foundry is a good place to work

This plant, located in Utica, New York, has an enviable record of 53 years' continuous operation. It is a major producer of steam, water, and warm air heating equipment as well as general jobbing castings production.

The East foundry, completed three years ago, offers its employees a clean, well-lighted, safe, good place to work.

International's advantageous place in community life in and around the Utica area is assured by management's policy of continually modernizing equipment and facilities to reduce manual labor for its 150 people.

Long service records are routine at International, thanks to modern dust collection apparatus, continuous conveyor lines, up-to-date locker and shower rooms, and overhead tramrails.

Herman Molding Machines, like the 3000 lb. Jarr Rollover illustrated, help to make International a good place to work. They're rugged, dependable, and simple to operate. One rotary valve handle controls the complete cycle of operation.

And, throughout the world, Hermans make their way by the way they're made.

Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

WANT TO DOUBLE BELT LIFE?

New

"61"

CONTACT WHEEL

by **CARBORUNDUM**
TRADE MARK

will accomplish these things for you on *most* abrasive belt applications in the metal working field:

- Belt Life Greatly Increased.
- Increase Production Per Belt.
- Reduce Costs.
- Reduce "Down-Time"; Provide More Uniform Finish; Lessen Operator Fatigue.

LET US PROVE IT TO YOU!

Ask your CARBORUNDUM representative for a demonstration of this new "61" Contact Wheel in your shop, on your present production line. Or write Dept. F 82-113.

AMPEWIS

Only CARBORUNDUM
TRADE MARK

makes ALL Abrasive Products ...to give you the proper ONE

"Carborundum" is a registered trademark of The Carborundum Company, Niagara Falls, N. Y.

82-113

more production...less waste!

COLEMAN OVENS

Coleman Tower Oven at Forest City Foundries Co.

● **COLEMAN TOWER OVENS** produce perfectly baked cores, need less manpower, result in increased tonnages of better quality castings.

Patented open center, by increasing oven loading accessibility, improves productivity of the coremakers. Coleman Tower Ovens, using only 25% of the floor space required by batch-type ovens provide labor savings up to 75% by eliminating racks, trucks and other time-wasting handling methods.

Coleman Tower Ovens help you overcome acute labor shortages and scarcity of materials. They are vital in meeting the demand for increased casting production.

Only COLEMAN OVENS offer all these advantages:

- PERFECT DRYING AND BAKING eliminate manpower and casting losses due to make-overs and rejects.
- INCREASED PRODUCTION by making the most efficient use of skilled and unskilled labor.
- HEAVY DUTY CONSTRUCTION. Responsible for dependable performance, economical operation, and minimum maintenance cost.
- GREATEST SAVINGS IN FUEL by using the most economical fuel available.
- MOST ECONOMICAL CORE BINDERS, oil or resin, for your particular casting requirements, can be used.

A COMPLETE RANGE OF TYPES: COLEMAN OVENS are built in a complete range of sizes and capacities for every core-baking and mold drying requirement: Tower Ovens, Horizontal Conveyor Ovens, Car-Type Ovens, Transrack Ovens, Rolling Drawer Ovens, Portable Core Ovens, Portable Mold Dryers, etc.

THE FOUNDRY EQUIPMENT COMPANY

1831 COLUMBUS ROAD — CLEVELAND 13, OHIO

MEMBER FEMA

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

THE *Counter-balanced* WAY to Production Records...

...TABOR JAR-RAM, HAND ROLLOVER, HAND-D

IT'S tough when you have to "horse" a poorly balanced hand rollover back and forth all day. Makes production fall flat on its face, too.

That's why Tabor engineers put emphasis on rollover ease. They designed a counter-balancing mechanism which foundrymen everywhere swear *by*—not *at*. It's highly flexible. It's quickly and accurately adjusted. It holds where you put it. It allows man and molds to move faster with less effort.

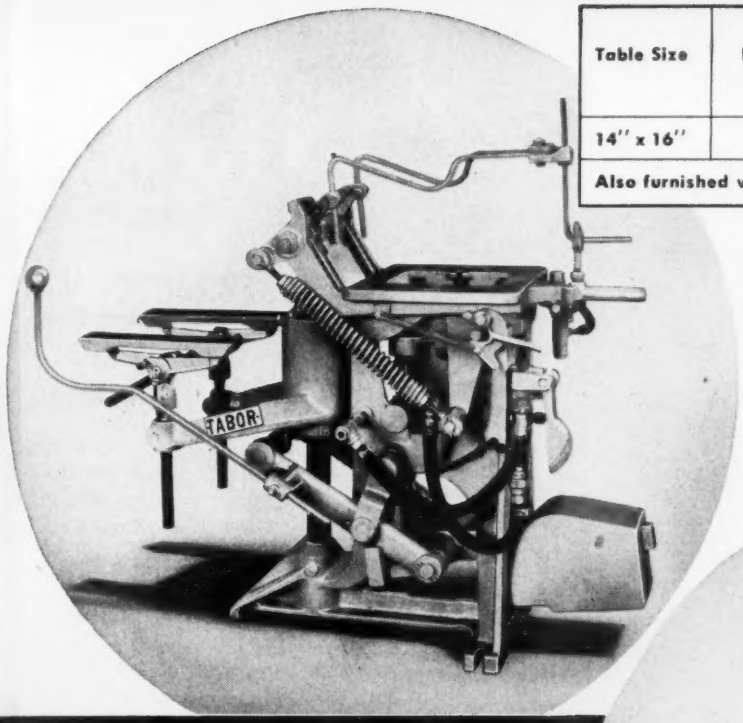
Add to this the efficiency of a jarring member that rams molds in record time. Include, too, the fact that table and rollover member will handle flasks or core boxes up to the full width specified, and up to any length within machine capacity. And the answer you get puts these machines in a class by themselves for production ability.

We'd like to translate this ability in terms of helping *your* set-up. We can, too! Just write, wire or phone and we'll be on the job.

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; Harry H. Reich, Trussville, Ala.

save labor...

Table Size	Draw	Space Available to take combined depth of Flask, Pattern Board and Bottom Board	Max. outside Flask or Core Box Width	Capacity @ 80# Pressure
14" x 16"	8"	10½"	18"	150#
Also furnished without jarring member				



ID-DRAW MACHINES

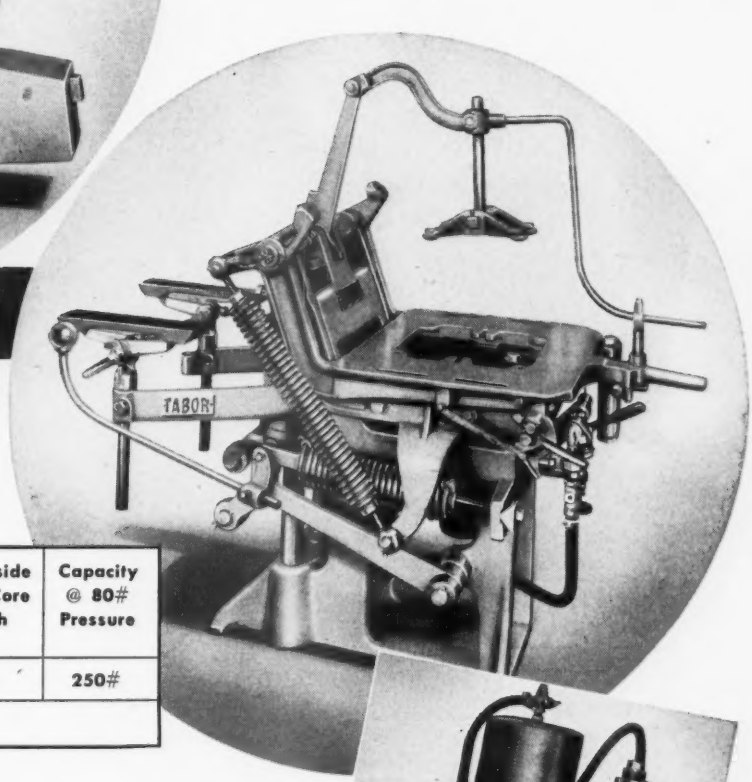


Table Size	Draw	Space Available to take combined depth of Flask, Pattern Board and Bottom Board	Max. outside Flask or Core Box Width	Capacity @ 80# Pressure
20" x 22"	10"	15"	22"	250#
Also furnished without jarring member				

The 14" x 16" machine can be furnished with a squeeze head. Handles work on which bottom board is to be rammed into mold and left there during pouring. Eliminates need for butt ramming. Molds drags at top speed. Equally adapted to core production as squeeze member can be swung out of the way. Squeeze Cylinder Diameter—10".

The **TABOR** *Manufacturing Co.*

SINCE **1884** MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

. . . buy *Tabor*

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

High Speed SMALL

T-4134
A distributing ladle receives molten metal from the teapot mixing ladle.

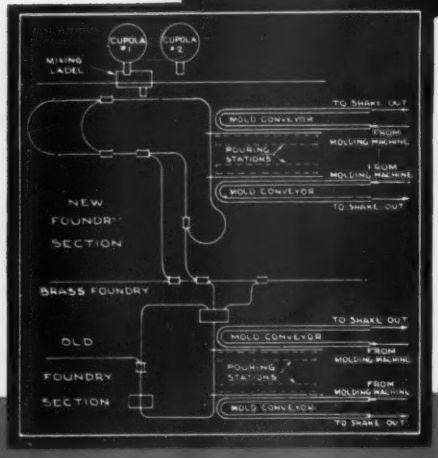
Every Foundry of Every Type and Size Can Profit with CLEVELAND TRAMRAIL

Hundreds of foundries from the smallest to the largest are now enjoying the many advantages that Cleveland Tramrail provides.

Regardless of your problem, if it's handling materials, Cleveland Tramrail can help you. And even if you do not have a problem, you should get the facts on what Cleveland Tramrail can do for you and plan now for the future.

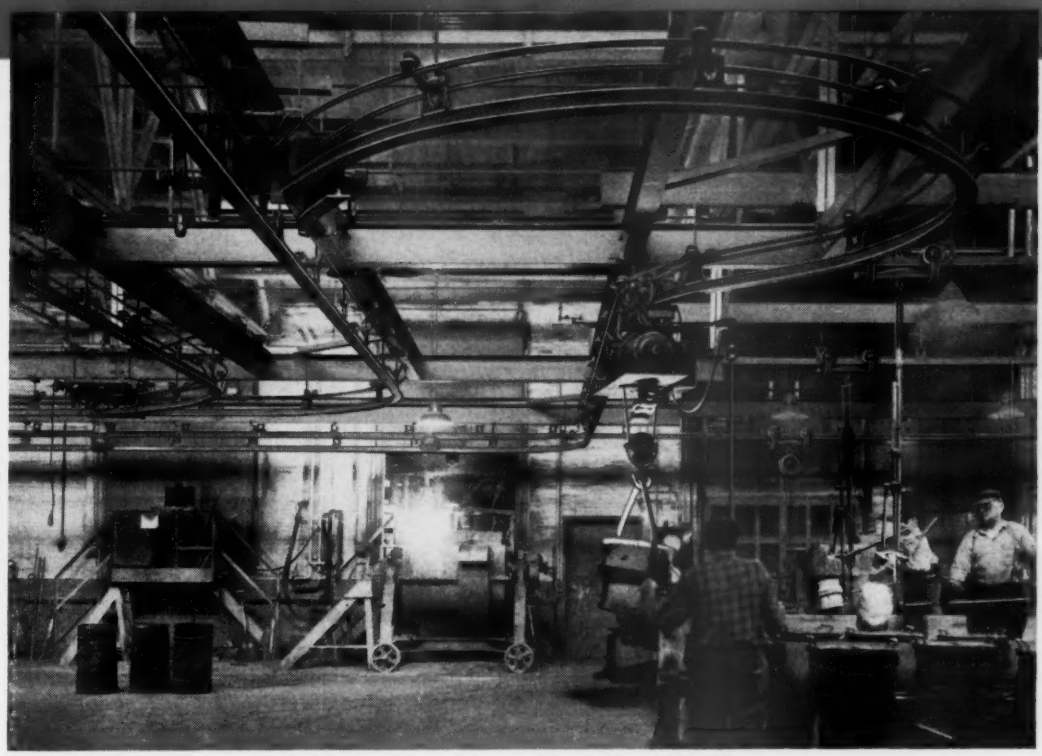
T-4135
The distributing ladle is transported to one of the mold conveyors where the metal is transferred to a pouring ladle. Note both of these ladles ride on hand-propelled overhead Cleveland Tramrail carriers. An electric hoist raises and lowers the distributing ladle. A lever arrangement changes the elevation of the pouring ladle.

T-4136
The molds are poured on the ma
conveyor as they pass this stati
Although pouring continues
day long at a rapid rate, there
no running helter-skelter or in
cient steps, because molds a
metal are brought together h
by efficient conveying methods



Layout of Cleveland Tramrail System

CASTING PRODUCTION



T-4132
View of overhead rail system serving the two mold conveyors in new foundry section. This is only a part of the extensive Cleveland Tramrail system in this modern foundry

For Tops in Production, Study This Clean, Orderly, Efficient Layout

For the production of small and medium castings, a combination of Cleveland Tramrail equipment and continuous mold conveyors is providing outstanding advantages for an Eastern foundry. Top efficiency is obtained and confusion and lost time reduced to a minimum.

There are four continuous mold conveyors which travel through the molding departments where the molds are received directly from the molding machines. Each conveyor has one man whose sole task is to pour the molds. A second man shifts the weights.

40 tons of grey iron are poured per 9-hour day. The metal is conveyed from the furnace to the pouring stations by the overhead Cleveland Tramrail system. One distributing ladle with operator is required to supply each mold conveyor where the metal is transferred to the small pouring ladles which also ride on tramrail carriers.

This is a high speed production foundry. It is clean and orderly and every detail systematized. Each man has a specific job. Because of the modern facilities provided he handles his work with ease and dispatch. His every step has been carefully planned for maximum efficiency and he cannot deviate from the routine established.

The mold conveyors set the production pace. This is slow enough so that the pourer can fill all molds and have sufficient time to refill his ladle. If for any reason the conveyor is moving too fast, it can be stopped temporarily.

Cleveland Tramrail equipment was originally installed in 1928 to serve the first two continuous mold conveyors put into operation. Because of its satisfactory performance Cleveland Tramrail was again chosen to serve two additional conveyors when installed in 1941.

CLEVELAND TRAMRAIL

DIVISION OF

THE CLEVELAND CRANE & ENGINEERING CO.

3803 EAST 286TH STREET WICKLIFFE, OHIO

FLY-ASH COSTS YOU MONEY...

in good-will... in expensive repairs!

THE WATER CURTAIN

CUPOLA COLLECTOR

WILL CLEAN-UP YOUR OPERATION

Fly-ash from your cupola can be a costly nuisance.

The deteriorating action on house paint, roofs, gutters on property adjacent to your plant may develop into a serious public relations problem.

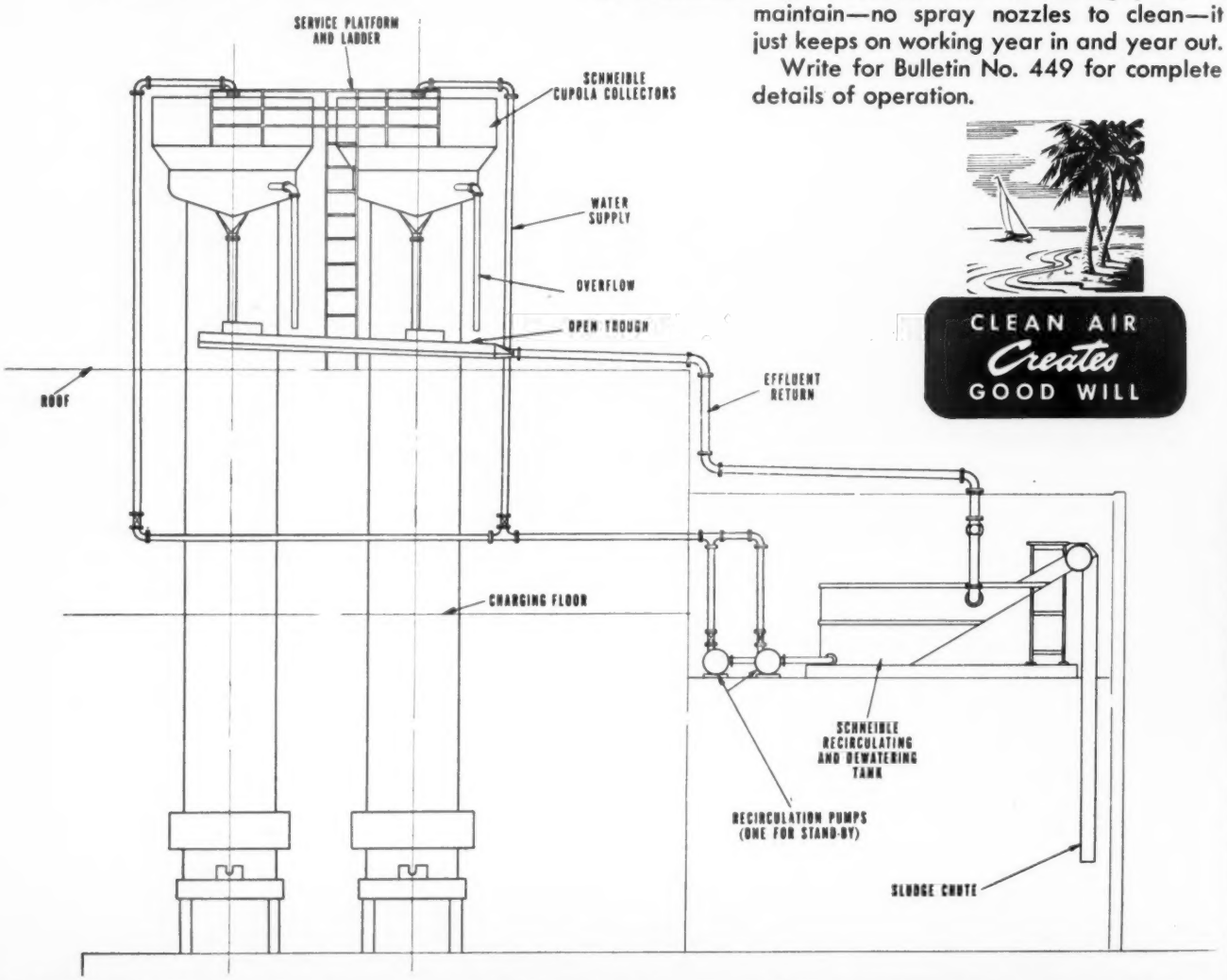
Fly-ash is indeed expensive when it destroys your own facilities and requires repair or replacement of roofs, window sash, gutters, stacks, motors and other equipment.

The Schneible Water Curtain type Cupola Collector reduces fly-ash to a minimum—cuts top side maintenance costs and eliminates fire hazard for yourself and neighbors.

Continuous recirculation of water through this collector picks up dust and sparks and returns them to a dewatering tank in the form of harmless, easily disposable sludge.

The Schneible Cupola Collector has no moving parts to maintain—no spray nozzles to clean—it just keeps on working year in and year out.

Write for Bulletin No. 449 for complete details of operation.



CLEAN AIR *Creates* GOOD WILL

CLAUDE B. SCHNEIBLE CO. • P.O. BOX 502—ROOSEVELT ANNEX • DETROIT 32, MICHIGAN

SCHNEIBLE

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Late FOUNDRY News

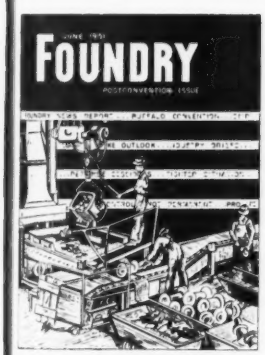
May 25, 1951

PIG IRON ALLOCATION: There's a possibility that pig iron will be allocated on a total or partial basis during the third quarter. NPA is appointing a task group from the Merchant Pig Iron Industry Advisory Committee to study the subject. NPA is showing concern over the increasing number of foundries reporting pig iron shortages. With some government estimates placing annual foundry output two years hence at 17 million tons of gray iron, 1.6 million tons of malleable iron and 3.5 million tons of steel castings, the problem of providing sufficient pig iron becomes even more difficult for the long term.

GROWING PAINS: Don't look for a well-oiled operation when the Controlled Materials Plan takes over July 1. The first three months likely will see some stumbling and minor changes in details of the plan—but not in its basic character. Thereafter the going should be smoother. NPA teams visited 20 leading industrial centers the middle of May, explaining to overflow audiences what will make CMP tick.

BRIDGING THE GAP: Builders of foundry equipment, machine tools, industrial furnaces and related industrial equipment will have special priority assistance during third quarter. This will help such companies while CMP priorities are becoming fully effective. NPA reasons that a rapid buildup of production tools is mandatory before accelerated output of finished products is possible. Foundry equipment manufacturers, using a special DO-75 rating, will be permitted to procure during third quarter 115 per cent of the steel they consumed in the first quarter, 110 per cent of the copper products and 105 per cent of the aluminum products.

FOUNDRIES AND CMP: Castings producers will be affected less by introduction of CMP than will manufacturers who consume the controlled materials —steel, copper and aluminum. The various forms of these metals to be allocated include steel castings (but not gray iron or malleable iron), copper and copper-base alloy castings, and aluminum ingot. To assist NPA in allotting copper products under CMP, brass and bronze foundries are required to file a series of monthly reports of their operations. On Form NPAF-84 they will report deliveries of castings, classified by program or end use. On Form NPAF-83 they will report inventory, receipts and consumption of copper and copper-base materials. NPA is mailing copies of these forms; foundries which have not received them should apply to the Copper Division, Washington.



THE COVER: Shaking out annealing pots at malleable iron foundry of Texas Foundries Inc., Lufkin, Tex.
See page 110

PRICE REGULATIONS: Two new price regulations—CPR 22 and CPR 30—issued recently by the Office of Price Stabilization will have widespread effect on industry in general. However, castings do *not* come under either of these regulations; separate pricing rules, out shortly, will apply to foundries. CPR 22 covers some 75,000 general manufacturers. CPR 30 affects machinery and related manufactured goods, including foundry equipment. Both orders set price ceilings at a pre-Korean base plus actual increase in material costs through 1950 and increases in labor costs through Mar. 15, 1951. The Processing Machinery Section of the OPS Machinery Branch will handle pricing problems related to foundry equipment. Leslie J. Carson, Link-Belt Co., is chief of the branch, and H. A. Porter, Harris-Seybold Co., heads the section. Both are in Temporary S Bldg., Washington, phone Sterling 4200, extension 6534.

MORE PLANTS: Accelerated tax amortization certificates issued by the government for defense facilities now cover more than one thousand new or expanded plants. Total eligible for amortization on these facilities is nearly $4.8 billion. Latest authorizations include $300,000 for Wagner Malleable Iron Co., Decatur, Ill.; $6,131,375 for National Malleable & Steel Castings Co. (four plants); $1,508,064 for Belle City Malleable Iron Co., Racine, Wis.; $134,911 for City Pattern Foundry & Machine Co., Detroit; $1,022,800 for Vulcan Mold & Iron Co., Lansing, Ill.; $153,815 for Casting Engineers Inc., Chicago.

SCRAP ROUNDUP: Continuing shortage of ferrous scrap is prodding efforts to expedite collections on a nation-wide basis. Eventually the movement will

enlist the help of government agencies, states, counties and municipalities, as well as industry. Castings salesmen—and sellers of other products — will be asked to assist in flushing out dormant scrap from their customers' plants. American Iron and Steel Institute has organized a joint committee of foundrymen, scrap dealers and steelmakers to deal with the scrap problem. Chairman is Robert W. Wolcott, chairman, Lukens Steel Co. Max Kuniansky, Lynchburg Foundry Co., is a vice chairman. Other foundry committeemen are: H. S. Faust, Hansell-Elcock Co.; F. H. Handfelder, American Steel Foundries; F. Kermit Donaldson, Steel Founders' Society of America; Lowell D. Ryan, Malleable Founders' Society; W. W. MacMillen, National Malleable & Steel Castings Co.

FEF AT MICHIGAN: Establishment of the University of Michigan, Ann Arbor, as the fourteenth institution affiliated with the Foundry Educational Foundation now is in process. Fred J. Walls, International Nickel Co., Detroit, has been appointed chairman of the temporary advisory committee to the University of Michigan and John F. Smith, Chevrolet-Saginaw Gray Iron Division, General Motors Corp., Saginaw, Mich., succeeds Mr. Walls as chairman of the Michigan State College advisory committee.

LATE BRIEFS: Apex Smelting Co., Chicago and Cleveland, has abandoned its plan to build a primary aluminum producing plant because of its inability to reach a mutually satisfactory agreement with the government on amortizing cost of the facilities. . . . Great Lakes Carbon Corp. has started work on 40 new ovens at its merchant coke plant in St. Louis . . . Carl F. Lauenstein, chief metallurgist, Link-Belt Co., Indianapolis, was killed in the Pennsylvania railroad train wreck at Bryn Mawr, Pa., May 18 . . . William Kerber, Hanna Furnace Corp., is the new chief of the Metals Branch, OPS. He succeeds Sam Ewing, Youngstown Steel & Alloy Corp., now assistant director, Industrial Materials & Manufactured Goods Division, OPS . . . Hy Bornstein, chief technical consultant, Deere & Co., Moline, Ill., will receive a 1951 Award of Merit from the American Society for Testing Materials at its Atlantic City convention.

AROUND THE COUNTRY: For other developments affecting foundries in important industrial centers, see page 144.

PRICES OF FOUNDRY METALS AND COKE

(As of May 25, 1951)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$17.00-18.00
New River	19.50
Wise County	15.95
OVEN	
Birmingham	$20.30
Chicago	23.00
Detroit	24.00
Erie, Pa.	23.50
Everett, Mass.	24.80
Indianapolis	22.75
Kearney, N. J.	22.75
Milwaukee	23.75
Painesville, O.	24.00
Philadelphia	22.70
Neville Island (Pittsburgh)	23.00
Portsmouth, O.	22.50
St. Louis	24.25
Swedeland, Pa.	22.00
Terre Haute, Ind.	22.50

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$54.50	$55.00
Birmingham	48.88	....
Buffalo	52.50	53.00
Chicago	52.50	52.50
Cleveland	52.50	52.50
Everett, Mass.	53.25	53.75
Fontana, Calif.	58.50	....
Geneva, Utah	52.50	....
Granite City, Ill.	54.40	54.90
Lone Star, Tex.	48.50	48.50
Neville Island (Pittsburgh)	52.50	52.50
Steelton, Pa	54.50	55.00
Swedeland, Pa.	56.50	57.00
Toledo, O.	52.50	52.50
Troy, N. Y.	54.50	55.00
Youngstown, O.	52.50	52.50

NONFERROUS INGOTS

BRASS AND BRONZE: 85-5-5-5—29.00c; 88-10-2—43.25c; 80-10-10—35.00c; No. 1 yellow—25.00c. **ALUMINUM:** 99 per cent plus, primary ingots 19.00c. Secondary No. 12 alloy 29.50-30.25c. **MAGNESIUM:** 99.8 per cent standard ingots 24.50c, f.o.b. Freeport, Tex. **COPPER:** Electrolytic 24.50c, Connecticut valley; Lake 24.61½c, delivered. **ZINC:** High grade 18.60c, delivered.

IRON AND STEEL SCRAP

(Ceiling prices per gross ton as established by the Office of Price Stabilization)

	*No. 1 Heavy Melting Steel	**Steel, 2 ft & less	Punchings, Plate Scrap	Cast Iron Briquets
Birmingham	$39.00	$41.00	$41.50	$39.00
Buffalo	43.00	45.00	45.50	43.00
Chicago	42.50	44.50	45.00	42.50
Cincinnati	43.00	45.00	45.50	43.00
Cleveland	43.00	45.00	45.50	43.00
Detroit	41.15	43.15	43.65	41.15
Eastern Pa.	42.50	44.50	45.00	42.50
Los Angeles	35.00	37.00	37.50	35.00
Pittsburgh	44.00	46.00	46.50	44.00
San Francisco	35.00	37.00	37.50	35.00
St. Louis	41.00	43.00	43.50	41.00
Seattle	35.00	37.00	37.50	35.00

Above delivered prices are ceiling levels at basing points indicated. * Applies to dealer and industrial scrap; railroad heavy melting is $2 higher. ** Foundry steel 1 ft and under is $2 higher.

CAST IRON SCRAP

No. 1 cupola cast	$49.00
Heavy breakable cast	45.00
Burnt cast iron	41.00
Cast iron brake shoes	41.00
Stove plate	46.00
Clean auto cast	52.00
Unstripped motor blocks	43.00
Iron wheels, No. 1	47.00
Malleable	55.00
Drop broken machinery cast	52.00

Above ceiling prices, per gross ton, are f.o.b. shipping point. Add transportation charges to obtain delivered prices at any foundry.

Rotor's 15 New "Multi-power" Chippers are easier to handle . . . do jobs faster

The unique hollow piston and "doughnut" valve of the 15 new Rotor "Multi-power" Chipping Hammers provide the 1-2 punch to cut your chipping costs.

Lighter Weight. These new Rotor Chippers average 1½ to 2 lbs. lighter than other chippers making them easier to handle.

Shorter. Exclusive "doughnut" valve makes possible saving of 1″ to 2″ in length, making it easier to get into those tough, crowded corners.

Faster Cutting. You get more blows per minute . . . because of new exclusive design.

3 Models in 1. By a simple change of parts you can adapt each of the 5 basic models to serve as 3 hammers to match your job: (1) A "regular" model, (2) A "super-speed" model, (3) A "super-sock" model.

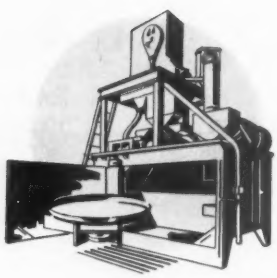
This is the biggest advancement in chipping hammers in the past 15 years! Find out all about it! Write for catalogue No. 37.

AIR O'TOOL

cuts cleaning time 75%

increases cleaning room efficiency

WHEELABRATOR airless blast cleaning



At the CHERRY BURRELL Foundry, Sheboygan, Wisconsin, a Wheelabrator Swing Table replaced 3 tumbling mills and increased cleaning efficiency. Previously, the tumbling mills had been operated 8 to 12 hours daily and still there was a constant backlog of gray iron castings awaiting cleaning. Due to inadequate cleaning, manual wire brushing was required on many parts, grinding and chipping was excessive and breakage was high.

cuts cleaning time 75%

Installation of the versatile Swing Table slashed cleaning time at least 75%. On some castings, the reduction in cleaning time is even greater. For instance, the 640 pound ice cream freezing machine base, illustrated at the right, is Wheelabrated in just 6 minutes compared to the 5½ hours required by tumbling.

increases cleaning room efficiency

All castings are cleaned in 4 to 5 hours daily—there is no carry-over work for the following day. Chippers and grinders are never idle since the Wheelabrator maintains a steady flow of thoroughly cleaned castings.

cleans more thoroughly

The Wheelabrator provides a better finish and more thoroughly cleaned surface. It removes the sand from cavities and interior surfaces to eliminate wire brushing, reduce chipping and grinding time, and speed machining operations.

eliminates breakage

Castings with sharp edges and corners which formerly had been broken during tumbling are now cleaned without damaging.

saves floor space

The Wheelabrator Swing Table occupies considerably less floor space than the 3 tumbling mills and in addition less space is needed for storing castings awaiting cleaning.

provides for expansion

Since the Swing Table is operated less than half a day, foundry production can be increased at least 100% without adding an extra shift or new equipment.

lowers costs substantially

Power costs have been greatly reduced, valuable time and labor have been saved and subsequent operations have been speeded.

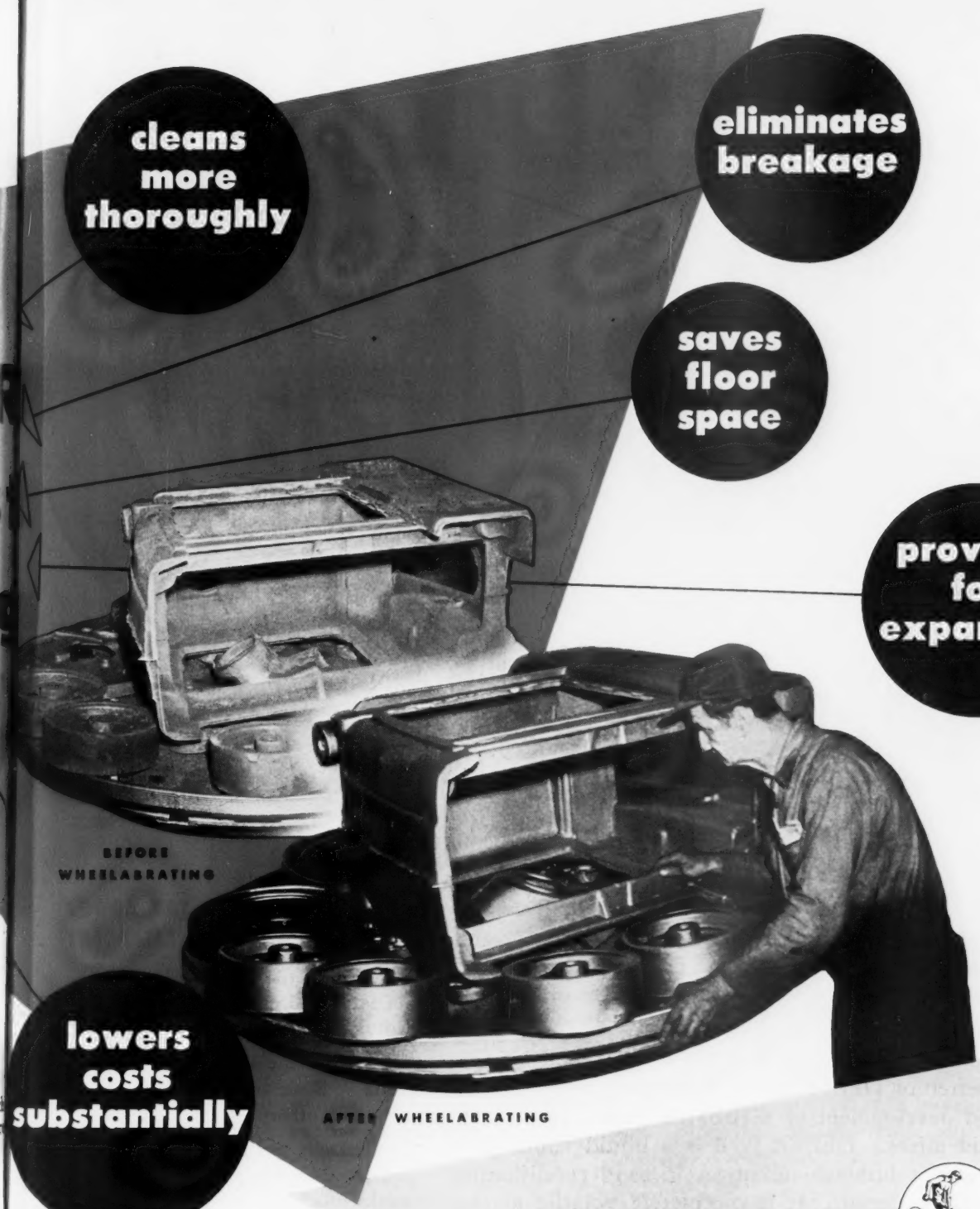
cleans more thoroughly

eliminates breakage

saves floor space

provides for expansion

lowers costs substantially



let us prove these results for you

All you have to do is send sample parts to the quarter-million dollar Wheelabrator testing laboratory. We will process these parts for you without obligation, giving you accurate production estimates for comparison with your present methods. It will pay you to make this test. Write today for full details.

American

WHEELABRATOR & EQUIPMENT CORP.

505 S. Byrkit Street Mishawaka 2, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

Now.... DELTA

96·B SAND RELEASE AGENT

PREVENTS STICKING ...MAKES SAND FLOW FREELY

Another Foundry "First" by DELTA

HAS BEEN PROVED AND ACCEPTED BY LEADING FOUNDRIES

By adding only 8 ounces or less of DELTA 96·B SAND RELEASE AGENT, per ton, to your core or molding sand mixes, your sands will flow freely . . . be easier to handle . . . easier to use. They will not stick to core boxes or patterns no matter how intricate they may be.

DELTA 96·B SAND RELEASE AGENT is the result of persistent research by DELTA Laboratories devoted to the discovery and development of a lubricant-dispersant for use in sand mixes. DELTA 96·B is a liquid which provides properties hitherto unknown in sand conditioning materials. It is completely volatile at elevated temperatures and does not contaminate the sand.

Prove it yourself in your own foundry. Ask for a test sample. No cost or obligation. You will also receive instructions for use. Write today.

READ WHAT USERS SAY ABOUT DELTA 96·B SAND RELEASE AGENT

". . . . with the addition of 96·B we get improved core density and more uniformly-rammed mold hardness."

". . . . with the addition of 8 ozs. of Delta 96·B we are now able to blow cores we otherwise couldn't blow."

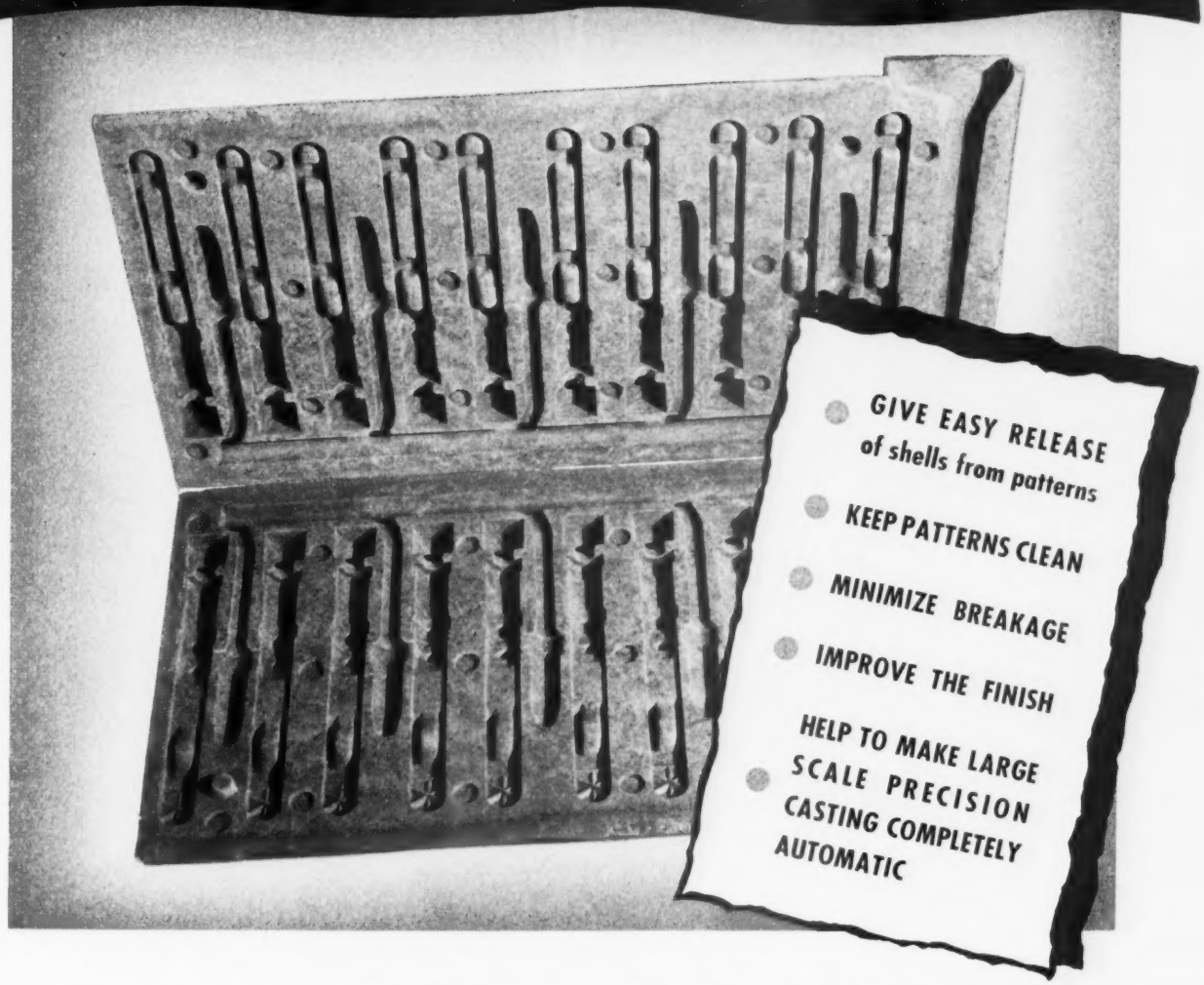
". . . . Delta 96·B gives the sand improved flowability. Our sand now works much more freely and leaves the core boxes clean."

". . . . and the trouble we had with sand sticking in the hoppers, in the chutes and on the conveyor has been eliminated with the use of Delta 96·B."

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

DOW CORNING SILICONE RELEASE AGENTS SIMPLIFY SHELL MOLDING


GIVE EASY RELEASE of shells from patterns
KEEP PATTERNS CLEAN
MINIMIZE BREAKAGE
IMPROVE THE FINISH
HELP TO MAKE LARGE SCALE PRECISION CASTING COMPLETELY AUTOMATIC

The Silicone Release Agents, originated by Dow Corning and introduced to the rubber, plastic and plywood industries in 1946, now offer large savings in the foundry field.

"Silicone jelly" was mentioned as a release agent for phenolic-sand molds in the August 1950 issue of MATERIALS AND METHODS. It was referred to again in the discussion of "Shell Molding and Use of Resin Binders" during the 55th Annual AFS meeting. In both cases, the "Silicone Jelly" was Dow Corning 7 Compound.

WRITE TODAY FOR SAMPLE OF DOW CORNING 7 EMULSION

water dilutable silicone emulsion developed especially for shell molding.

OR DOW CORNING 7 COMPOUND

applied by wiping or by spraying from a solvent solution

AND DATA SHEET NO. AH-6 or TECHNICAL ASSISTANCE

from our engineering specialists in SILICONES AS RELEASE AGENTS

DOW CORNING SILICONES

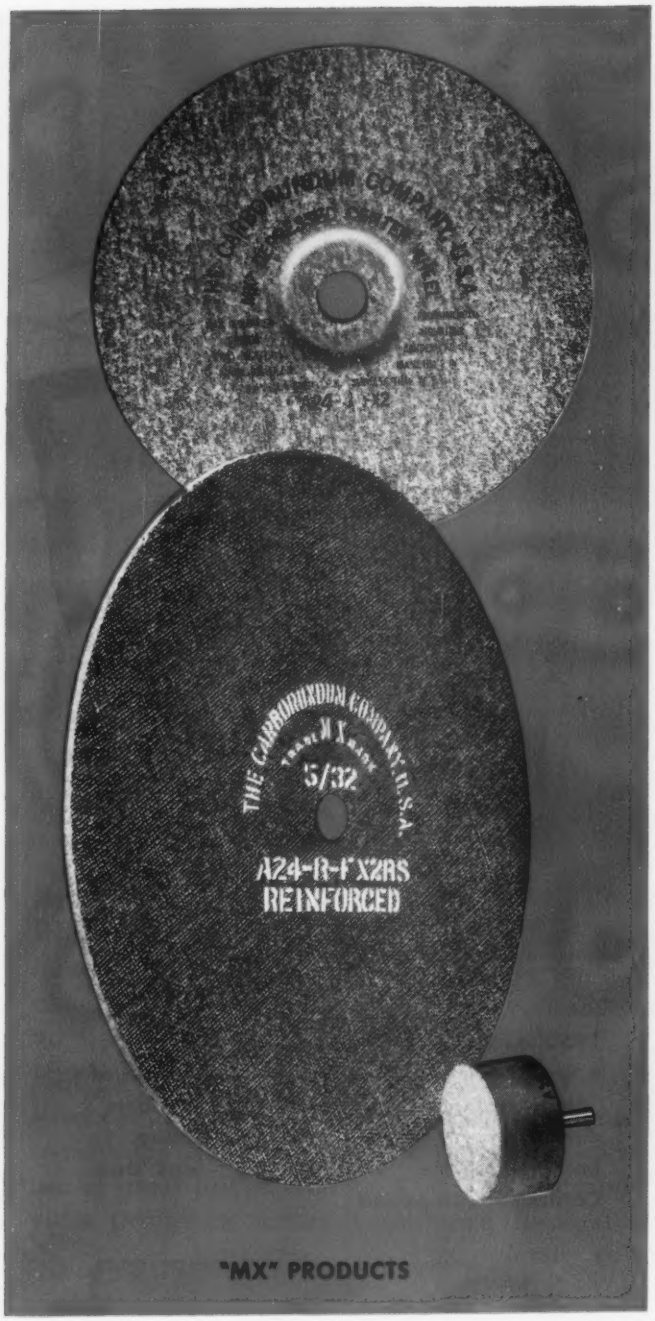
DOW CORNING CORPORATION

DOW CORNING CORPORATION, MIDLAND, MICHIGAN

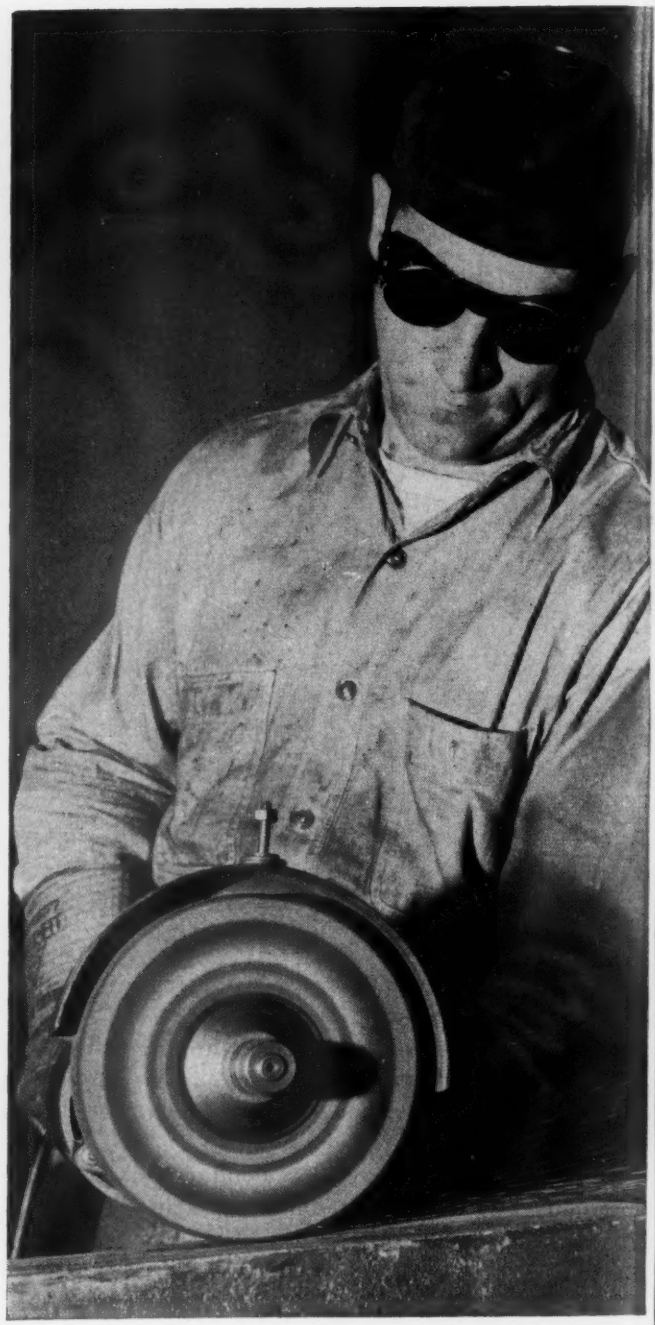
ATLANTA • CHICAGO • CLEVELAND • DALLAS • LOS ANGELES • NEW YORK • WASHINGTON, D. C.

For Low-Cost High-Speed Portable Grinding

THE RIGHT



"MX" PRODUCTS

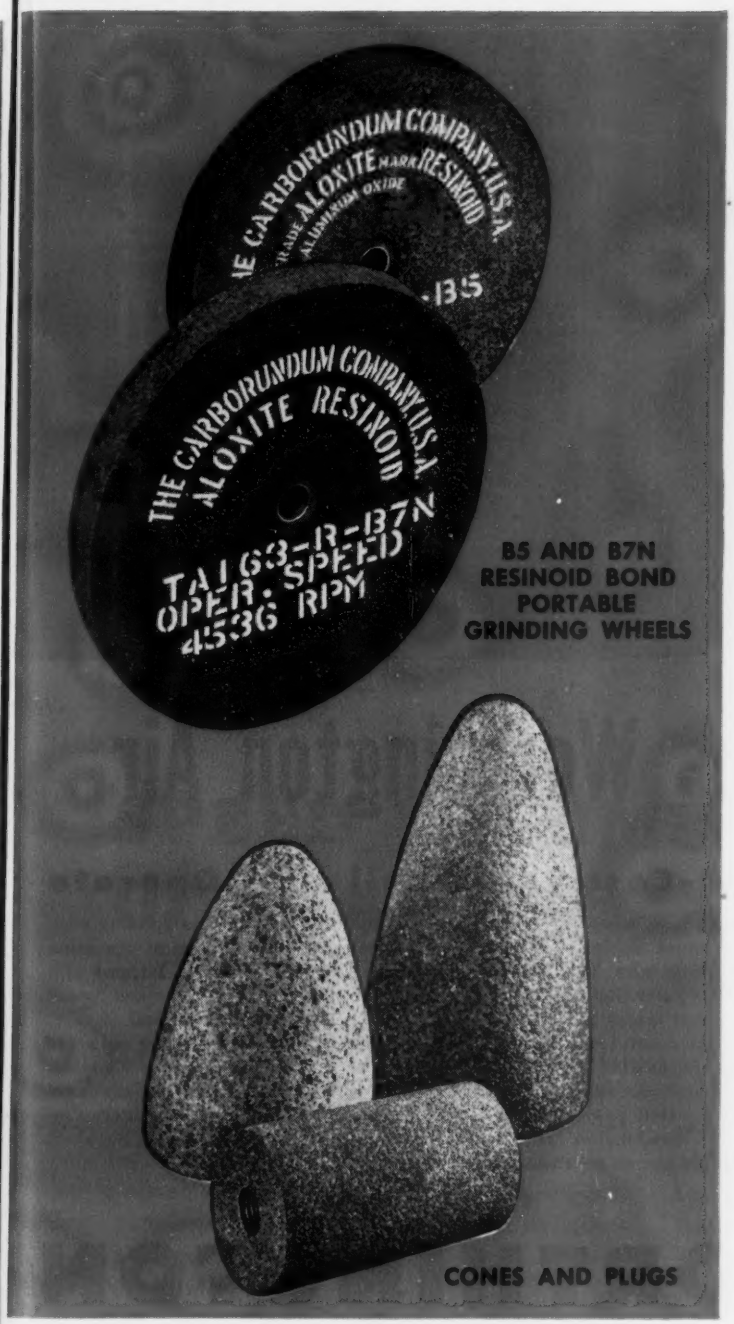


Only CARBO

TRADE

"Carborundum", "MX" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York.

T ABRASIVE IS ESSENTIAL



With today's emphasis on high-speed grinding it is more important than ever to be sure of highest efficiency through proper selection of abrasives.

Only CARBORUNDUM makes a *complete* line of abrasives, from which selection can be made of the *right* one for the job. This *selectivity* of abrasives combines with product quality and experience in manufacture to give you a surer route to meeting high-production quotas efficiently.

B5 AND B7N RESINOID BOND PORTABLE GRINDING WHEELS with *built-in rubber bushing* are typical of high-efficiency products by CARBORUNDUM. These new wheels lessen operator fatigue by dampening vibration . . . increase production efficiency by reducing wheel "bounce." Proper mounting is assured through metal-to-metal contact provided by steel liner.

"MX" PRODUCTS include plain straight, depressed center and mounted wheels for portable grinders. They are ideally suited to high-speed operation in cut-off, slotting, edge breaking, deburring, weld grinding and surface finishing...and perform over this wide range of applications with maximum safety.

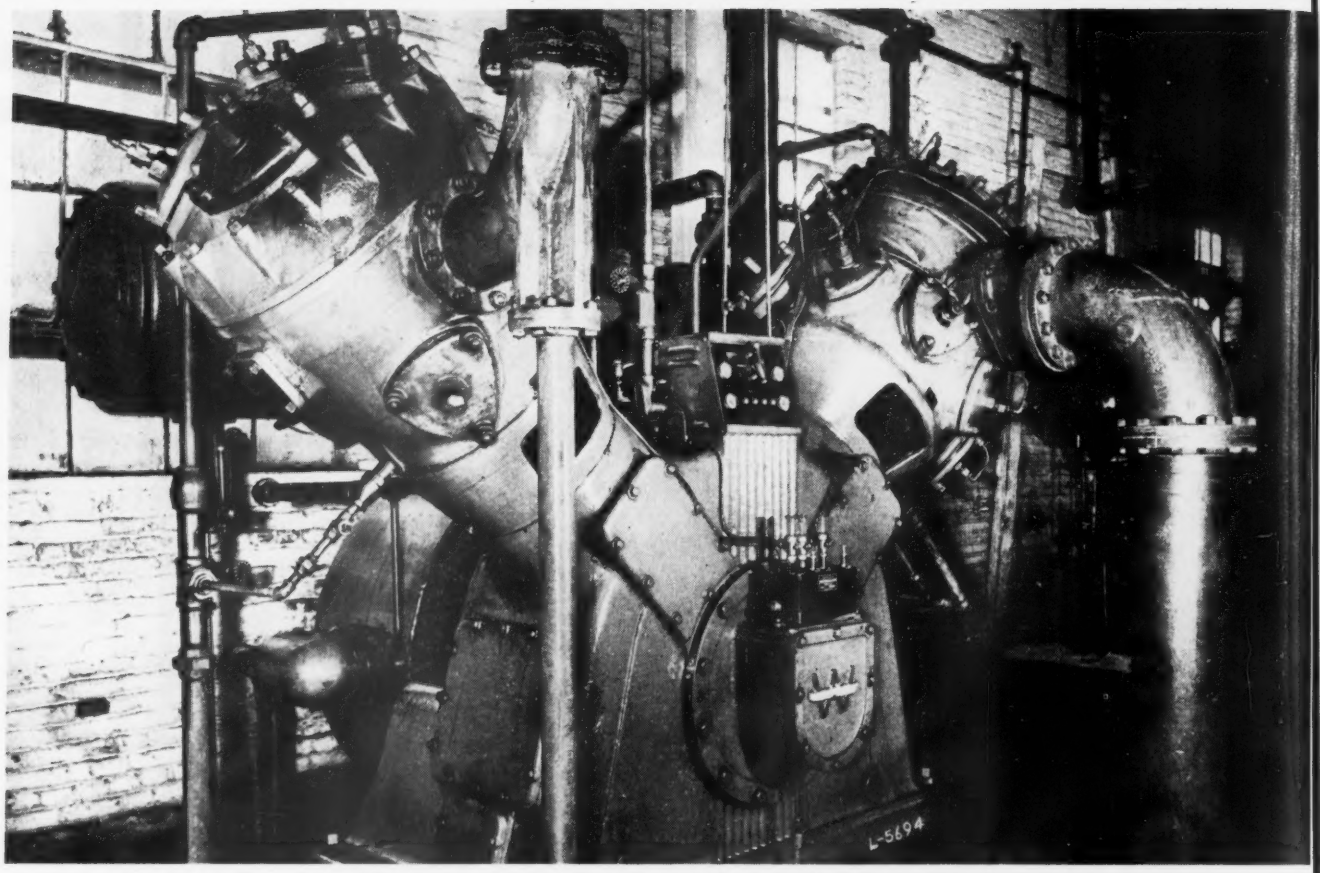
CONES AND PLUGS by CARBORUNDUM are produced in a wide range of shapes and sizes to maintain high production rates on hard-to-get-at surfaces.

● Other abrasive products for high-speed as well as low-speed grinding are included in the *complete* CARBORUNDUM line. See your CARBORUNDUM representative, or write Dept. F 81-17.

RUNDUM

MARK

makes ALL Abrasive Products...to give you the proper ONE



Lynchburg Likes Worthington Air

As you probably know, Lynchburg Foundry Co. in Lynchburg, Virginia has one of the most modern plants in the country.

They use compressed air to power much of their work. With compressed air, they get *dependable* power and lower costs of operation and maintenance.

And with their *Worthington* Air Compressors, they get lowest-cost compressed air and longest compressor life.

*Reg. U. S. Pat. Off.

Lowest-Cost to Install and Operate

A Worthington DC-2 was installed in 1945—a horizontal duplex direct-connected compressor with Worthington's famous Feather* Valve (lightest, tightest, most efficient ever made) . . . automatic variable capacity control, the most simple, accurate and flexible control available . . . and a high-efficiency intercooler that needs less water, power, attention.

In 1948, a Worthington YC-2 was added. This unit comes *pre-assembled*—no alignment problem, no erecting engineer needed. Its economical operation comes from its balanced Y-frame (for higher rpm), Feather* Valve and 3- and 5-step variable capacity control.

So take a tip from Lynchburg and get to know why *there's more worth in Worthington*. Write for Air Compressor bulletins to Worthington Pump and Machinery Corporation, Compressor Division, Buffalo 5, New York.

WORTHINGTON

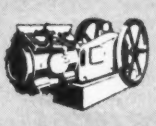
K.1.5

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON

Y-types

Balanced Angle

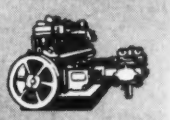
Horizontal



Radial

Portable

Gas Engine Compressor



PSC
Designed-for-Job
CONTAINERS...

SPEED VOLUME ANNEALING OF SMALL ARMAMENT PARTS

The basket in the upper left was designed for an aircraft plant for annealing aluminum and magnesium castings. With movable sides and trays, it cuts handling time materially. The perforated pot at right was furnished a defense contractor for fast handling of small parts at a Homo furnace. Some PSC designed-for-the-job fixtures have eliminated as many as three complete handlings.

Furthermore, PSC welded alloy units save time because, being 2/3 lighter than cast equipment, they handle faster; and require less time to attain pot heat. A recent study of one customer's cycle showed a total saving of 5 hours.

Let our technical staff work with you in devising time-saving units. As pioneers of light-weight, sheet alloy, heat-treating containers and fixtures, we make available to you a wealth of designing and production know-how. We furnish equipment in any size. Send blue-prints or write as to your needs.

PSC "Light Weight"

Heat-Treating Equipment for Any Product and Any Metal

Carburizing and Annealing Boxes
Baskets · Trays · Fixtures
Muffles · Retorts · Racks
Annealing Covers and Tubes
Pickling Equipment
Tumbling Barrels · Tanks
Cyanide and Lead Pots
Thermocouple Protection Tubes
Radiant Furnace Tubes and Parts
Heat, Corrosion Resistant Tubing

THE PRESSED STEEL COMPANY

of WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

☆ ☆ ☆ OFFICES IN PRINCIPAL CITIES ☆ ☆ ☆

More and More Foundries Using SMITH L-O CORE OIL

A look at our orders shows a record number of foundries are now relying on Smith L-O to keep production humming. • Jobbing and production foundries working with both ferrous and non-ferrous metals appreciate the time-saving, cost-reducing results achieved with Smith L-O. Cores are easier to make, bake; they are tough, yet flexible; castings of a superior quality are the end result. • Try this core oil of *controlled uniformity* in your foundry. There's a grade suitable for your requirements.

WAREHOUSE STOCKS AVAILABLE

In The Following Cities

- COLUMBIAN WAREHOUSE CO. Reading, Pennsylvania
- FOUNDRY SERVICE CO. Birmingham, Alabama
- E. R. FROST CO. Minneapolis, Minnesota
- F. F. SHORTSLEEVE Elmira, New York
- MALCOLM G. STEVENS Arlington, Massachusetts
- PACIFIC GRAPHITE CO., INC. Los Angeles 22, California
- ST. LOUIS COKE & FOUNDRY SUPPLY CO. *(formerly M. W. Warren Coke Co.)* St. Louis, Missouri
- WESTERN FOUNDRY SAND CO. Seattle, Washington
- WESTERN INDUSTRIAL SUPPLY CO. Portland 14, Oregon

Smith L-O Core Oil

ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.

MANUFACTURERS OF L-O AND CERTIFIED CORE OILS

INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

DON'T BUY A PIG IN A POKE . . .

or sell one either

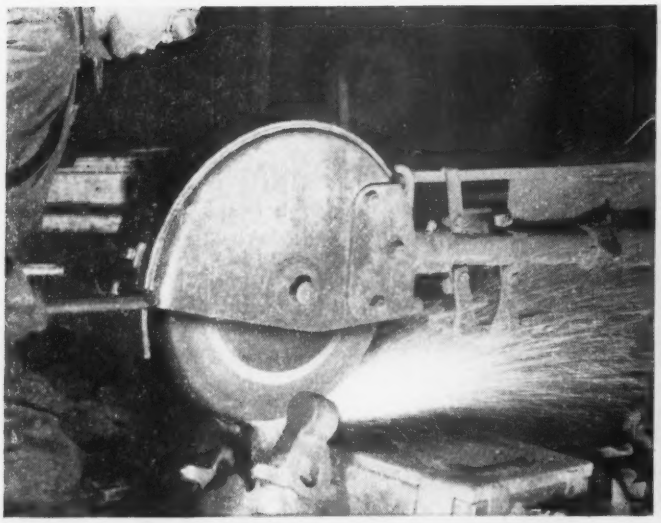
X-RAY

With the world's finest radiographic apparatus now available, why take chances on buying or selling imperfect castings. It's like a pig in a poke when you do, for only x-ray equipment can detect many hidden defects in castings.

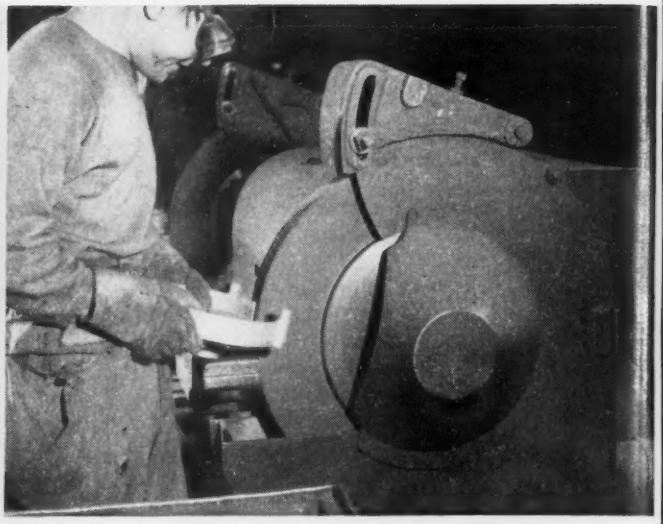
Scores of companies now rely on General Electric X-Ray industrial units, such as the OX-250 shown here, for proof of sound castings. Job lot or production line, x-ray fits. Spot checking or 100% inspection, it can be adapted to your particular need. A pound of metal or a ton, there's a GE X-Ray unit to meet the need — dependably, economically, profitably.

Write for Pub. 11A-3116 "Radiography as a Foundry Tool." General Electric X-Ray Corporation, Dept. YY-6, Milwaukee 14, Wis.

GENERAL ELECTRIC
X-RAY CORPORATION



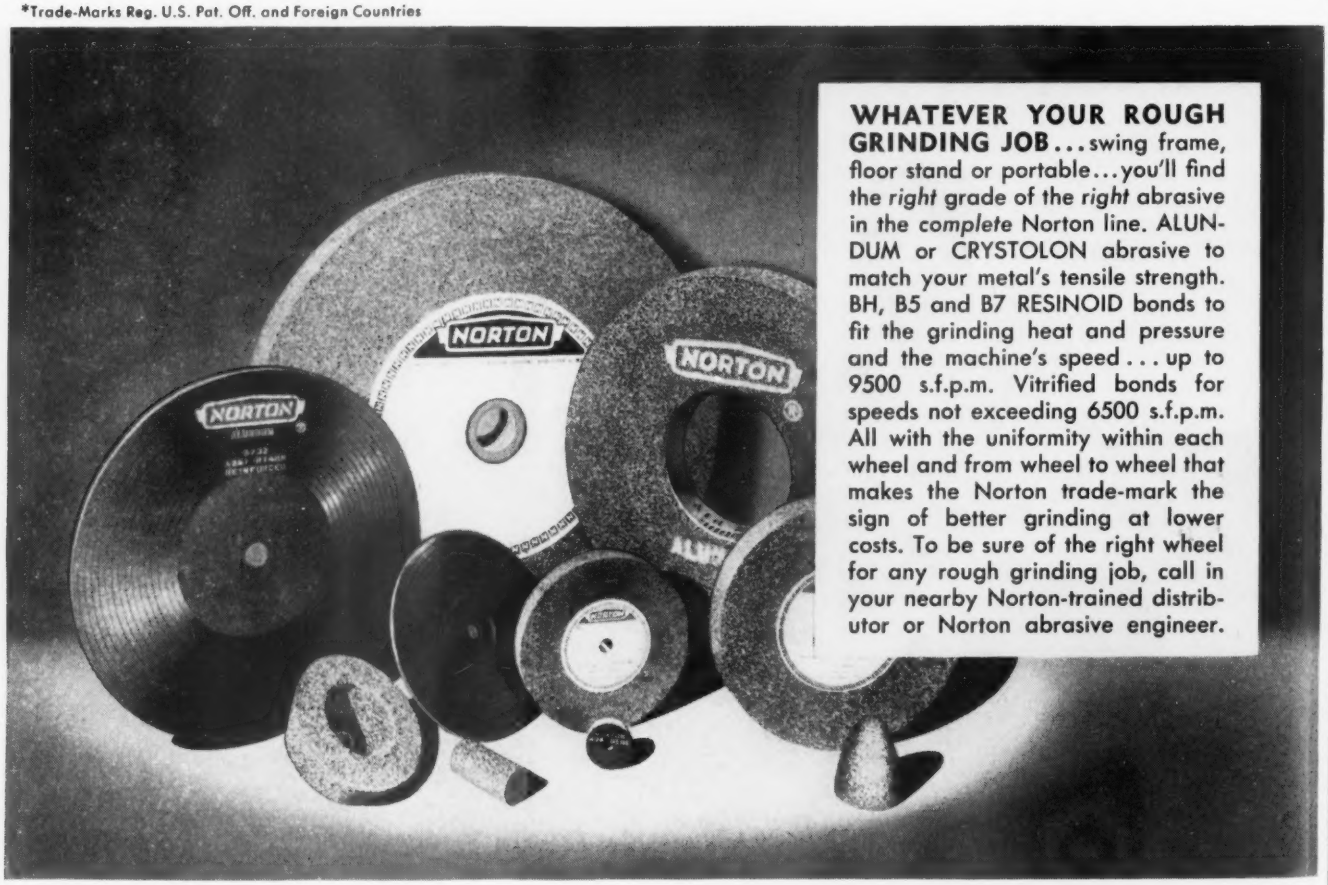
WHEN THE PRESSURE'S HEAVY . . . Norton ALUNDUM* or CRYSTOLON* wheels with BH or B7 RESINOID bond take high-speed heat in stride . . . giving you fast, clean cuts without sacrifice of wheel life. Select Norton ALUNDUM abrasive for steel and annealed malleable iron; CRYSTOLON abrasive for gray iron, unannealed malleable iron and non-ferrous metals.



WHEN THE PRESSURE'S LIGHT . . . Norton ALUNDUM or CRYSTOLON wheels with B5 RESINOID bond get the call. They combine cutting qualities with wheel economy in a way that makes your high-speed grinding look good and your costs look better. Again, Norton ALUNDUM abrasive when the metal's tensile strength is high; CRYSTOLON abrasive when it's low.

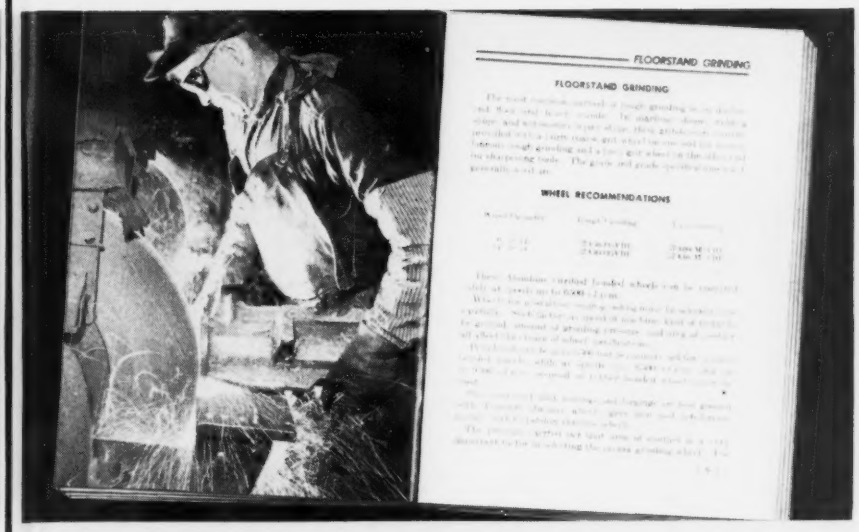
Snag off more metal per dollar.

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries



WHATEVER YOUR ROUGH GRINDING JOB . . . swing frame, floor stand or portable . . . you'll find the *right* grade of the *right* abrasive in the *complete* Norton line. ALUNDUM or CRYSTOLON abrasive to match your metal's tensile strength. BH, B5 and B7 RESINOID bonds to fit the grinding heat and pressure and the machine's speed . . . up to 9500 s.f.p.m. Vitrified bonds for speeds not exceeding 6500 s.f.p.m. All with the uniformity within each wheel and from wheel to wheel that makes the Norton trade-mark the sign of better grinding at lower costs. To be sure of the right wheel for any rough grinding job, call in your nearby Norton-trained distributor or Norton abrasive engineer.

NORTON *Making better products to ma*



YOU SNAG OFF MORE METAL PER DOLLAR when you base your wheel selection on *all the facts* about rough grinding. That's why it will pay you to read this 48-page booklet prepared by Norton abrasive engineers. In addition, its convenient selection charts, like the one shown above, give you valuable help between calls of your Norton representative. Write for FORM 1405.

r . . . with the right Norton wheel

Production speed and grinding economy are more important to you than the size of your wheel inventory.

When you replace wheels that are almost right with exactly the *right* wheel specification for every rough grinding job, you increase production and reduce costs. That's plain common sense. To insure lowest cost production the wheels must fit such variables as: the materials to be ground . . . the amount of stock to be removed . . . the degree of accuracy and finish required . . . the area of contact . . . the amount of pressure applied and heat generated . . . the type of grinding machine.

All these factors are covered in great detail in the Norton booklet on Rough Grinding. Out of each page pop such valuable guides to proper wheel selection as:

ALUNDUM abrasive wheels for grinding tough alloy and carbon steels, soft malleable iron castings.

CRYSTOLON abrasive wheels for cast iron, hard malleable iron castings, brass, aluminum, and magnesium.

Softer Grades and Coarse Grain Sizes where grinding pressure is light or area of contact is large.

Harder Grades and Coarse Grain Sizes for heavier grinding pressures.

Fine Grain Sizes and hard grades for narrow contacts and good finishes.

Resinoid Bonds for high-speed grinding.

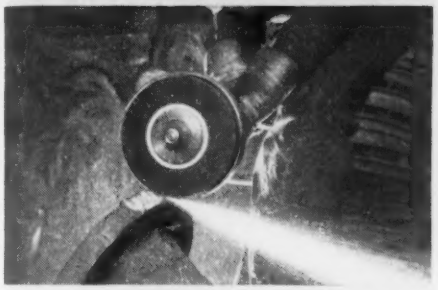
Vitrified Bonds for slower speeds.

These and many other production-boosting, cost-cutting factors are authoritatively covered in this 48-page Norton booklet. Ask your nearby Norton representative or distributor, or write direct for FORM 1405. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.

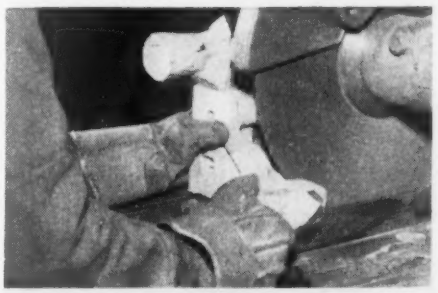
NORTON
ABRASIVES

make other products better

It Pays To Know All The Facts



HIGH SPEED ON THE CURVES is no problem at all when you select from the complete line of Norton portable grinding wheels. There's a cup, cone, plug, or mounted point for every radius . . . all with the famous Norton built-in balance that makes them hug the work. Try them and see!

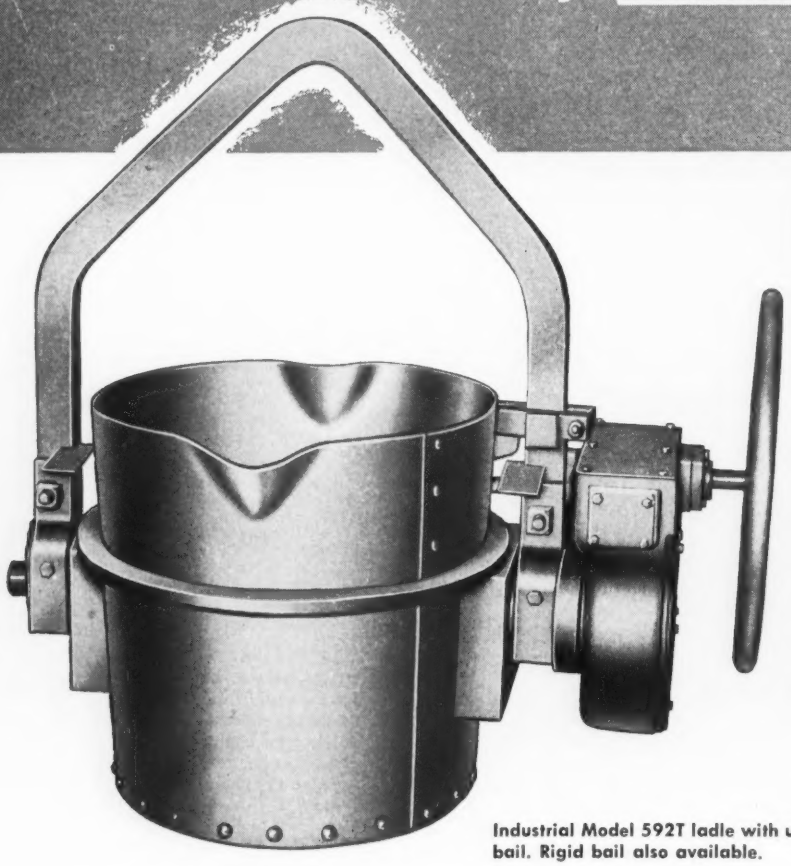


25% FASTER THAN BAND SAWS for removing sprues, gates, and risers from nonferrous castings, report users of the NORFLEX* reinforced resinoid cut-off wheel. Its reinforced construction and knurled sides make it your *safest* bet for jobs where side-grinding, twisting, and bending cause conventional wheels to break. Worth testing!

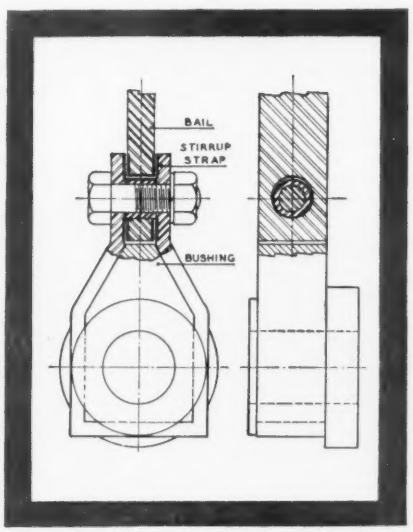
3 JOBS WITH ONE WHEEL will be your experience, too, when you put a Norton Reinforced Hub Wheel to work. The same wheel not only does rough and finish grinding, but also notches risers in ferrous castings. Reinforced by strong fabric with an extra safety web molded into the hub side, it's the safest, most durable wheel of its kind in the field. Compare!

NORTON COMPANY
Worcester 6, Mass.
Distributors in all principal cities

AT LAST... Binding due to heat distortion COMPLETELY ELIMINATED in this revolutionary Universal Bail Design



Industrial Model 592T ladle with universal bail. Rigid bail also available.



More flexibility than a universal joint. Ample vertical and horizontal adjustments. Misalignment taken care of by rotating swivel action.

Here is one of the really fundamental advances in geared ladle design. Binding problems caused by the steady rise in pouring temperatures have been solved . . . with no sacrifice in strength, safety, or simplicity.

You get four distinct advantages with this new universal bail by Industrial Equipment:

1. **Binding due to heat distortion is eliminated.**
2. **Binding due to misalignment is eliminated.**
3. **Gear wear due to binding is eliminated.**
4. **No lubrication or adjustment is ever needed.**

This new bail is the result of a project on which Industrial Equipment has been working for over four years. Many novel and ingenious designs were proposed and discarded before the final design was accepted. Like all good things it is simple. Yet notice that in addition to simplicity it is rugged, safe, and dependable.

You should also know that this new bail has been thoroughly foundry tested. We emphasize this because the more severe the conditions, the more evident was its design superiority. Operators, for example, say they have never operated a ladle that was easier to handle *regardless of conditions.*

Look to Industrial Equipment for the really basic improvements in foundry pouring and handling equipment. *Write, wire, or telephone today for full details.*

Do you have our revised catalog No. 35?

Industrial EQUIPMENT CO.

115 N. OHIO ST., MINSTER, OHIO

LADLES • BOWLS • SHANKS • BAILS • TONGS • SPECIAL EQUIPMENT

MALLEABRASIVE®*

(SHOT AND GRIT)

SAVES $2995.00 a year CLEANING CASTINGS Like These!

Here's the report from Lynchburg Foundry

Lynchburg took advantage of Pangborn's offer to test Malleabrasive in their own shop. They tested it against ordinary shot for three months, and *their own records* prove Malleabrasive saves them $2995.00 a year on blast cleaning. Not only that, but replacement parts cost has been reduced *73.8%*—and abrasive handling has been cut in half!

Malleabrasive is the *original* long-life abrasive pioneered by The Globe Steel Abrasive Co., Mansfield, Ohio. Pangborn invites you to test Malleabrasive as Lynchburg Foundry did. Use it in your own cleaning room and find out exactly how much you can save!

SEND FOR FREE TEST KIT

Contains all the forms you need to run an impartial test. Remember, Malleabrasive is guaranteed to outperform ordinary shot and grit when comparative tests are properly run. For your free kit, write today to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment

These savings are possible because MALLEABRASIVE

- *is designed for modern cleaning equipment*
- *wears out fewer machine parts*
- *lasts 2 to 4 times longer*
- *reduces machine down-time*
- *reduces cleaning costs up to 50%*
- *increases output of cleaned castings*

PLACE A TEST ORDER TODAY

Packed in orange striped 100-pound bags with this tag.

*U. S. Patent #2184926 (other patents pending)

Pangborn

BLAST CLEANS CHEAPER with the right equipment for every job

Control Foundry Chilling with...

CHILL KOOLHEAD NAILS

CHILL NAILS and SPIDERS in many types and sizes

Choose any style chill nail from jumbo to stubby; slim, medium, or horse nail blade; blunt, pointed, straight or 90° bent. Same types available in Stainless, Brass, Aluminum; Copper coated to order. Spider Chills, jumbo or horse nail legs—double or single. Available in various sizes and types; also made to your individual specifications. Whatever your chill job, rely on "KOOLHEAD."

Equally reliable—the "STANHO" precision quality line of Taper Pins, Woodruff Keys, Machine Keys, Cotter Pins, Straight Pins, Knurled Pins and all sorts of finished specialties and made-to-order parts.

Write for detailed descriptions and prices.

Other Quality Products

STEEL Stanho PRODUCTS

PINS KEYS

SPECIAL PARTS

STANDARD HORSE NAIL CORP.

Since 1872

NEW BRIGHTON, PA.

F-4

"dag" Dispersions Lubricate, Assist Parting at any Foundry Temperature

"Dag" dispersions offer numerous advantages as parting compounds and as lubricants because they work at *any* temperature to be met in the foundry . . . even up to 5000° F. in inert atmospheres.

Use **"dag"** dispersions to coat permanent molds, patterns, flask pins, chills, cores, shoulder screws, push pins . . . even to coat ladle interiors.

Molds and patterns so treated give superior reproduction and smoother casting surfaces. Less finishing is required, often none at all. Rejects are fewer and inspection takes less time. Mold life is lengthened.

Binding and stripping of flask pins is eliminated, an important saving in time and maintenance. Chills and cores are easily removed without damage to castings. Molten metal flows freely and completely from ladles without waste from adhesion to inside surfaces.

Write today for the free Acheson booklet which describes in detail how these and other advantages of **"dag"** dispersions give you increased production, more pieces per hour of labor, and measurable material savings. Ask for Bulletin 425-14F.

dag DISPERSIONS®

Acheson Colloids Corporation Port Huron, Mich.

...also Acheson Colloids Limited, London, England

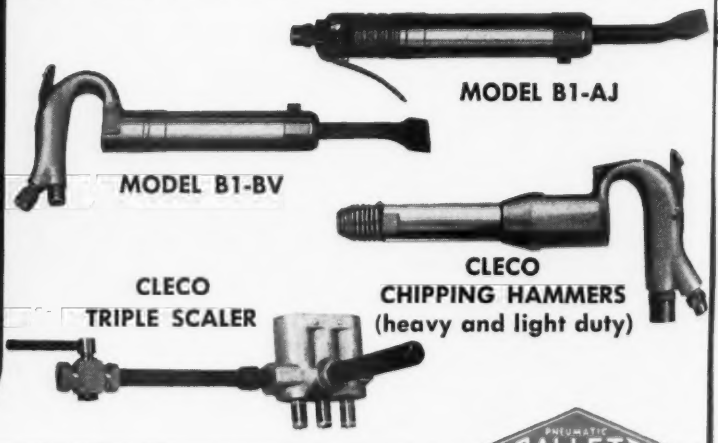
EVERY SHOP NEEDS THIS TOOL OF A HUNDRED USES . . .

CLECO
B-1 PNEUMATIC SCALING TOOL
for

- Removal of weld splatter
- Rust and paint scrapings
- Cleaning sand from small castings
- General scaling, beading and peining

- Swivel control valve prevents twisting of air hose
- Air admitted by hand pressure on tool
- Adjustable throttle valve controls power
- Steady jet of exhaust air removes chips
- Positive and sturdy chisel retainer

WRITE FOR BULLETIN 84



MODEL B1-AJ

MODEL B1-BV

CLECO CHIPPING HAMMERS (heavy and light duty)

CLECO TRIPLE SCALER

CLECO AIR TOOLS

DALLETT PNEUMATIC EQUIPMENT ACCESSORIES

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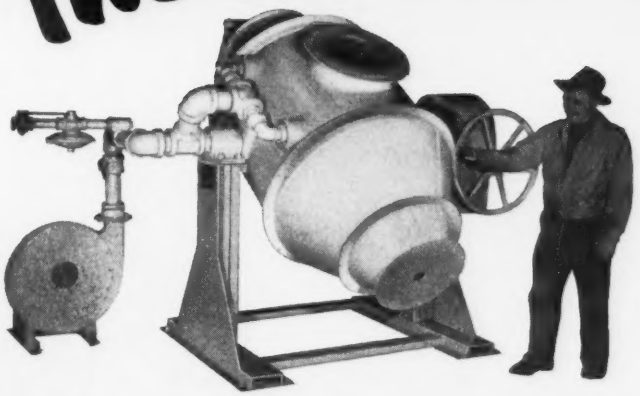
2726

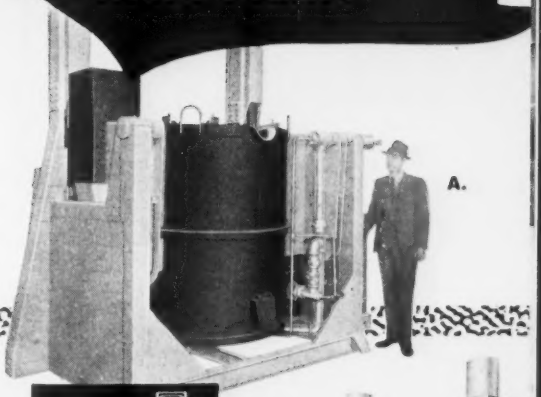
The Foremost Furnaces

for Melting any type of Non-Ferrous Metals in Foundries, Die Casting and Permanent Mold Plants



STROMAN MODEL "BFC" HAND TILT BARREL TYPE MELTING FURNACE FOR ALUMINUM

Featuring "Tangential Firing" which produces a most efficient combustion condition, creating a melting atmosphere that keeps metal loss and dross accumulation at a minimum. Charges through the top or rear door which is also used for drossing metal and cleaning the furnace. Built in 500 lb. capacity and larger. Oil or gas fire.

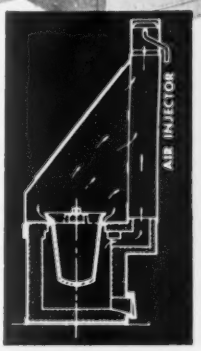


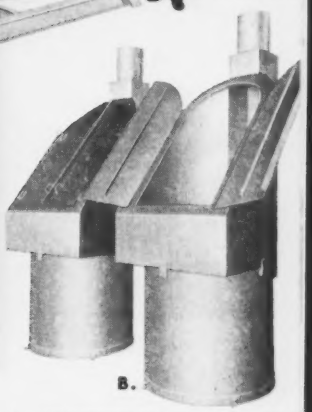
A.

STROMAN MAGNESIUM AND ALUMINUM MELTING AND HOLDING FURNACES

A. Hydraulic Tilt Magnesium and Aluminum melting furnace handling from 500 to 3000 lbs. of aluminum. Incorporates the famous Stroman Stationary Lip Pour, which creates a constant pouring arc at any desired pouring speed. Saves time and metal.

B. Stationary Super-Heating or Melting Furnaces, Type S. F. Designed to deliver the correct super-heat to magnesium after it has been melted in larger furnaces, and before it is poured into the molds. Can also be used for breakdown or holding. They have all safety features. Are available for cast steel pots or fabricated steel pots. Furnaces may be equipped with hoods if so desired, for the venting of combustion and other gasses. Write for bulletin No. 100.





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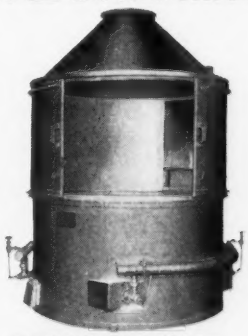
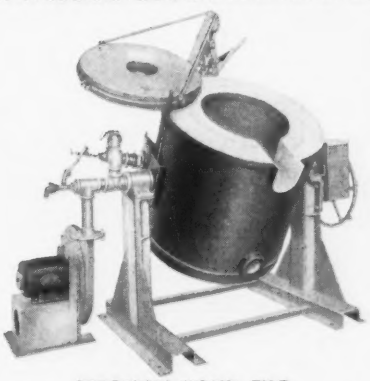


STROMAN IRON POT MELTING FURNACES FOR ZINC OR ALUMINUM

These furnaces are highly recommended as breakdown furnaces for zinc and aluminum die casting and permanent mold plants. They also excel as holding furnaces. They can be supplied either with or without hoods to exhaust fumes and heat. Their construction causes longest pot life and lowest fuel costs. Choice of automatic or manual controls and oil or gas fire. Capacities from 212 to 14,000 lbs. zinc.

Write for Bulletin No. 115



STROMAN HAND TILT CRUCIBLE MELTING FURNACE FOR BRASS, BRONZE, ALUMINUM AND OTHER ALLOYS

Capacities from No. 40 to No. 500 Crucible. Most efficient in operation. Rugged construction assures longest life and trouble-free operation. Oil, Gas or Combination Fire.

Write for Bulletin No. 105

STROMAN TYPE "MC" ALUMINUM DIP-OUT REVERBERATORY FURNACE

Bath capacity from 500 to 10,000 lbs. Aluminum

A combination of breakdown and holding furnaces makes this the most economical furnace ever designed for aluminum melting. It can be used for melting, holding, alloying, fluxing, for either casting or producing ingots. Cold metal does not reach the molten bath. Hot metal is always available for dipping. No iron pots or crucibles to buy. Oil, gas or combination oil-gas fire. Complete automatic controls are available if desired.

WRITE FOR COMPLETE CATALOGUE ON ALL TYPES OF FOUNDRY EQUIPMENT

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.

HAVE YOU FOUND THE ANSWER?

POOR QUALITY COKE

AS COKE GOES from bad to worse, it takes more for melting. Spout metal temperatures are down, and cupolas deliver less than rated capacity. Refractories burn out faster, and replacements are more expensive.

Costs are up . . . quality is down . . . rejects keep eating away at profits. And all the while customers demand higher and higher quality castings. Have YOU found the answer?

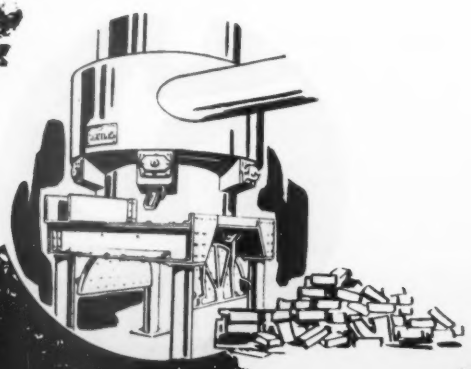
WE OFFER NO PANACEA

W POURING TEMPERATURES

Whiting has been in the foundry business too long to suggest a cure-all . . . but foundrymen who have changed to Whiting Cone-Bottom Charging Buckets are amazed at the improvement in their melting practice.

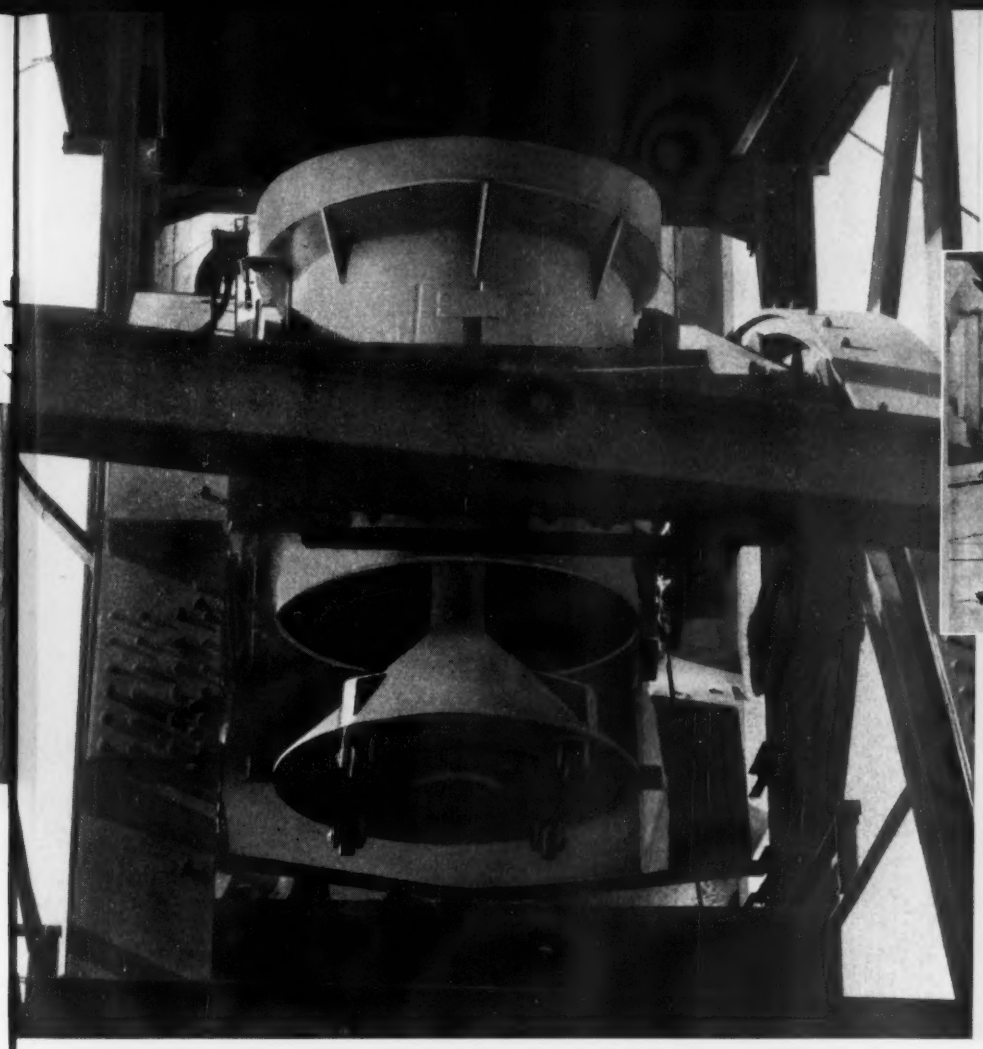
One operator recently told us, "Since installing your cone-bottom bucket, we are getting the hottest iron we've had since 1937."

If you are having trouble, don't wait! Call for a Whiting sales engineer, today.

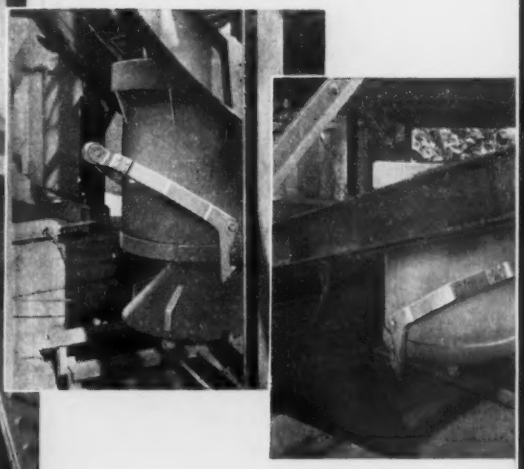


REFRACTORY BURNOUTS

TOO MANY REJECTS



← Whiting Cone-Bottom Bucket emerging from the cupola charging opening, ready to descend for reloading.



↑ Two views show operation of the automatic bucket-closing mechanism. At left, the bucket is open—cone about to come down against the bearing plates which raise it against the latch. In right-hand illustration, the bucket has closed and latched.

Whiting Cone-Bottom Buckets

FOR A MECHANICAL CHARGING JOB THAT CAN NOT BE EQUALLED EVEN BY THE BEST HAND-CHARGING PRACTICE

WHITING Cone-Bottom Buckets distribute the charge evenly around the outer edge and leave it more open in the center. Hence the blast distribution and gas flow are more uniform—bringing higher metal temperatures with less coke and less oxidation, and faster melting.

You can secure these benefits of cone-bottom charging from your present equipment by replacing drop-bottom buckets with Whiting Cone-Bottom Buckets. The new Buckets require no "wishbone" within the cupola; they are discharged by a release lever which opens automatically when the bucket arrives in discharge position in the cupola, and closes automatically as the bucket returns for loading. Full information on request.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

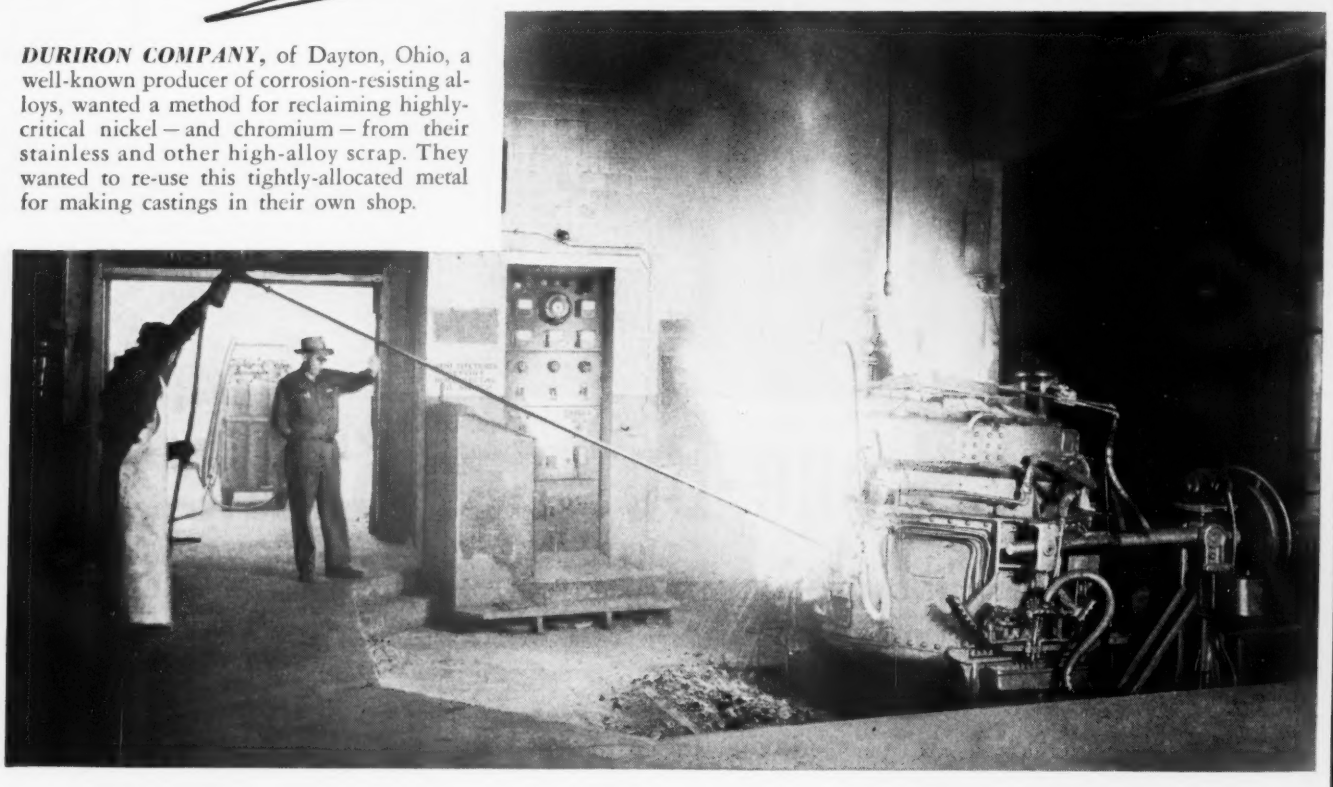
WHITING CORPORATION

15607 Lathrop Ave. Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Representatives in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Limited, Toronto, Ontario. Export Department: 30 Church St., New York 7, N. Y.

NEW Airco Oxygen Process reclaims nickel...chromium from stainless and high-alloy scrap

DURIRON COMPANY, of Dayton, Ohio, a well-known producer of corrosion-resisting alloys, wanted a method for reclaiming highly-critical nickel — and chromium — from their stainless and other high-alloy scrap. They wanted to re-use this tightly-allocated metal for making castings in their own shop.



W. T. Bryan, Duriron Co., and ***H. C. Linde,*** Airco Technical Sales Representative, working together, used oxygen refining as a means of removing carbon from the alloy steel bath. On the basis of experience, it was found that the carbon removal was accomplished without excessive oxidation of chromium from the high alloy scrap charge. Equally important, all of the nickel charged was recovered. This permitted the foundry to reclaim all scrap.

The Duriron Company was highly pleased with these results, and have adapted this process as standard practice ... and, now produce low-carbon, high-alloy castings from material that otherwise would be useless to them.

For further information about this modern method for reclaiming high-priority nickel — and chromium — from your scrap, call or write your nearby Airco office for Technical Sales assistance.

AIRCO

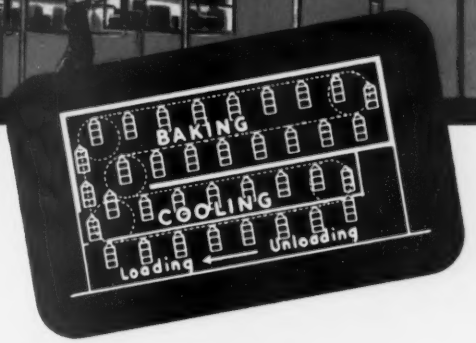
AIR REDUCTION

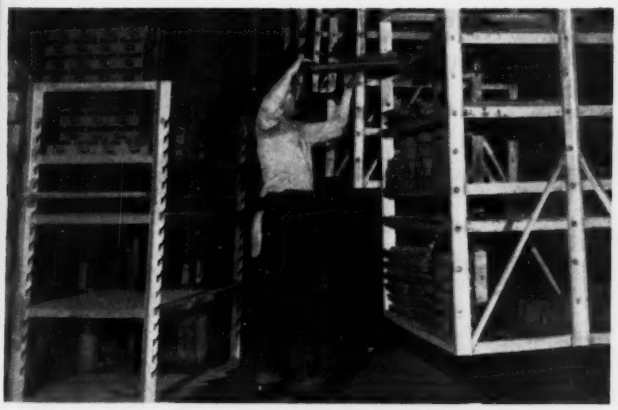
AIR REDUCTION SALES COMPANY • AIR REDUCTION MAGNOLIA COMPANY
AIR REDUCTION PACIFIC COMPANY
REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL
Divisions of Air Reduction Company, Incorporated
Offices in Principal Cities

GET MORE WORKING SPACE FROM PRESENT PLANT

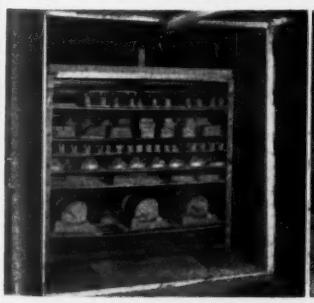
DESPATCH
ELEVATED CONTINUOUS CONVEYOR
CORE BAKING OVEN

DESPATCH combination gas-oil fired oven, 13 ft. wide, 27 ft. high, 52 ft. long. Has variable speed continuous conveyor. Cores make horizontal passes thru bake chamber, (see diagram) then enter fan-equipped cooling section.





DESPATCH conveyor ovens help boost core output-per-man as loading and handling are greatly simplified. Foundrymen appreciate the labor-saving features of DESPATCH Conveyorized Ovens.



Intermittent monorail conveyor DESPATCH oven with swing doors at both ends.

DESPATCH core and mold oven with heavy duty, electrically operated lift door.

This ingeniously designed DESPATCH oven gave foundrymen more working space from their present plant and increased core baking output at the same time. It provides ample baking capacity up to 84 tons per day and gives the foundry much needed floorspace. The oven is built to carry 38 long (7½′ x 2′ x 3′) core racks suspended from a continuous conveyor chain.

DO THESE ADVANTAGES INTEREST YOU?

1. SAVES FLOORSPACE: Platform-mounted heater, fans, controls, plus compact overall design, allow more work space on foundry floor.

2. ALLOWS FAST, EASY HANDLING: Built-in cooling section provides fast, uniform cooling. Eliminates fumes. Provides speedy unloading and reloading without delay.

3. STRAIGHTENS COREMAKING LINES: Unique design permits single open loading—unloading area, easily reached from all sides. Accommodates wide range of core sizes.

4. REDUCES BAKING COSTS: Efficient system recirculates up to 75% of heated air. Guarantees fast, even, low-cost baking.

Write today for Bulletin 30N

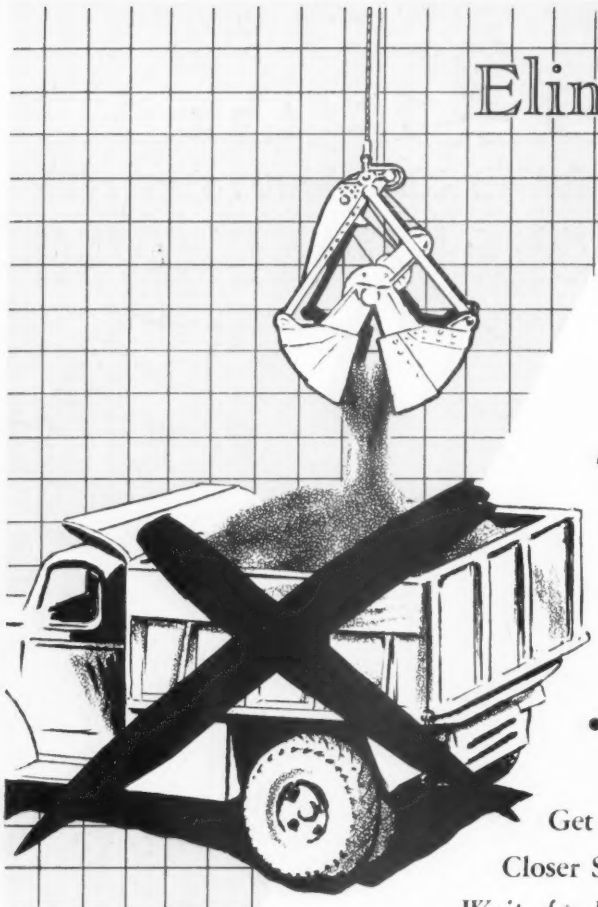
Minneapolis Office:
619 S. E. 8th St.

Chicago Office:
4554 Broadway

DESPATCH OVEN COMPANY

Eliminate Waste . . . .

Don't haul away spent foundry sand Reclaim it The Nichols Way



Save On Your

- New Sand Requirements
- Storage Area and Facilities
- Spent Sand Disposal

and

Get Better Quality Sand Through Closer Sand Control

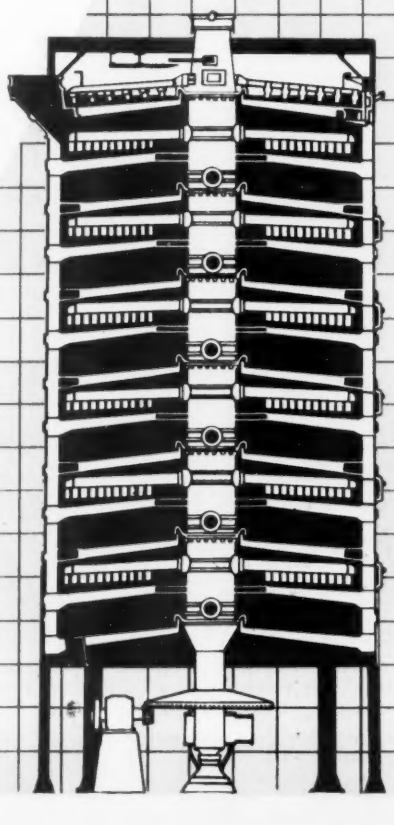
Write for Bulletin No. 222

Nichols Sand Reclamation Systems For

1. High Temperature Burning

or

2. Low Temperature Drying



NICHOLS

Engineering & Research Corp.

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CORN PRODUCTS REFINING CO.

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LARGEST SELLER IN THE FIELD!

the preferred dry bond for cores

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CLEANSI

Manufa

Famous CORNELL CUPOLA FLUX

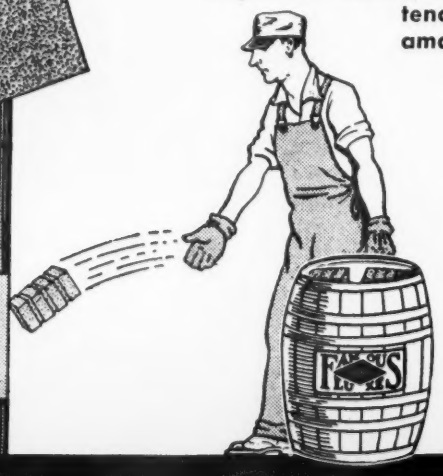
Leading gray iron foundries, and malleab foundries with cupola operation, consider t use of Famous Cornell Cupola Flux a "mus with every cupola charge.

BECAUSE

It removes impurities from molten iron, mak it hotter, increases fluidity and greatly reduc sulphur — sets the metal up for cleaner a sounder castings.

It improves the machinability of castings.

It ensures more efficient cupola operatio Drops are cleaner, linings last longer, mai tenance cost is reduc amazingly.



SCORED BRICK FORM

An exclusive feature Famous Cornell Cupola F Requires practically no bor in using. You sim lift it out of container toss it into cupola with e ton charge of iron, or br off one to three briqu (quarter sections) for sm er charges, as per inst tions.

Over 33 Years OF SUCCESS in CASTING IMPROVEMENT

The CLEVELAN

1026-1040 MAIN AV

Manufacturers of Iron, Semi-Steel, Malleable, B

Drop in Casting Rejects"!

YOUR MOLTEN METAL with Famous CORNELL FLUX

customers were new users years ago.

Present high wages and urgent customer demand for quick delivery of good castings, make it more necessary than ever to guard against rejects and make-overs.

CLEAN METAL ENSURES BETTER CASTINGS

For more than thirty-three years, the cost of using Famous Cornell Flux has been but a drop in a bucket compared to castings saved.

Famous CORNELL BRASS FLUX

CLEANSES MOLTEN BRASS, even when dirtiest brass ings or sweepings are used. You pour clean, strong tings which withstand high pressure tests and take a utiful finish. The use of this flux saves you consider- e tin and other metals and keeps crucible and furnace ngs cleaner, adds to lining life and reduces mainte- nce.

Famous CORNELL ALUMINUM FLUX

CLEANSES MOLTEN ALUMINUM so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula greatly reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

Ask for Bulletins.

LUX Company

W., CLEVELAND 13, OHIO

nze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

Powder-Cutting

Steps Up Production of Stainless Steel Castings 32 Times . . .

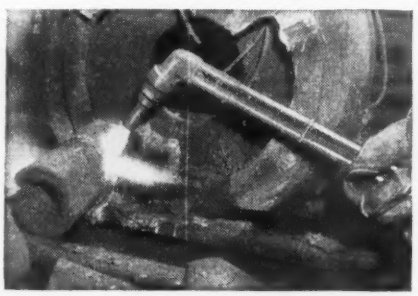
Riser cutting of centrifugally-cast stainless steel rings used to be a difficult and time-consuming job. In one foundry which used a boring machine, this operation took eight hours per casting. When powder-cutting was introduced, the time was reduced to approximately 15 minutes—a 32-fold increase in production.

In another foundry, powder-cutting was profitably used to remove 3/8 to 1 in. of metal from stainless steel castings. The machining cost for this type of work has been $24.00 per casting. Substitution of powder-cutting brought the overall cost, including finish-grinding and chipping, to $7.53 per casting, and reduced the time from 8 hours to 1 hour. For an order of 60 castings, the foundry saved $988.20 and 360 hours of operating time.

If you have stainless steel or other oxidation-resistant metals to cut,

Centrifugally-cast rings of stainless steel are cut in 15 minutes time, increasing production 32 times.

LINDE's service engineers can show you how powder-cutting methods can be used with profit. Phone or write the nearest LINDE office.



Here, risers on stainless steel castings are being powder-cut—a time saving of 30 per cent over the former methods.

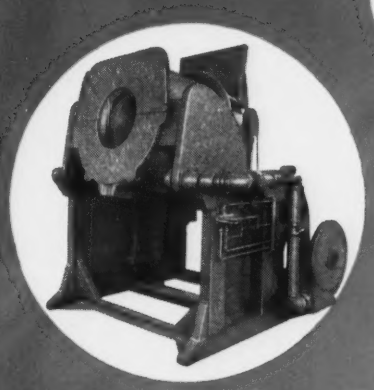
LINDE AIR PRODUCTS COMPANY

A Division of Union Carbide and Carbon Corporation

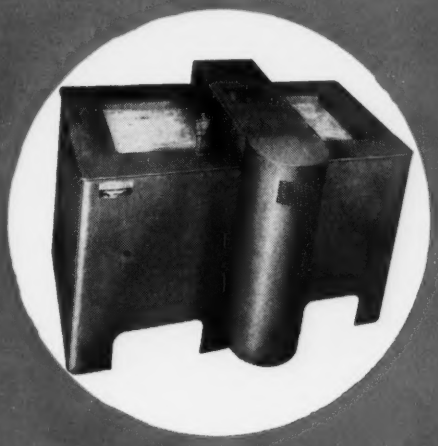
30 East 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities

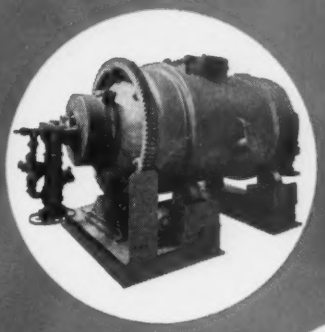
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

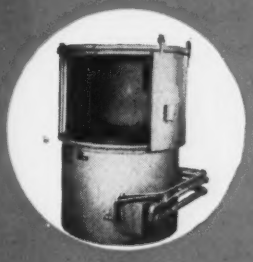
The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation



MELTING AND HOLDING FURNACES







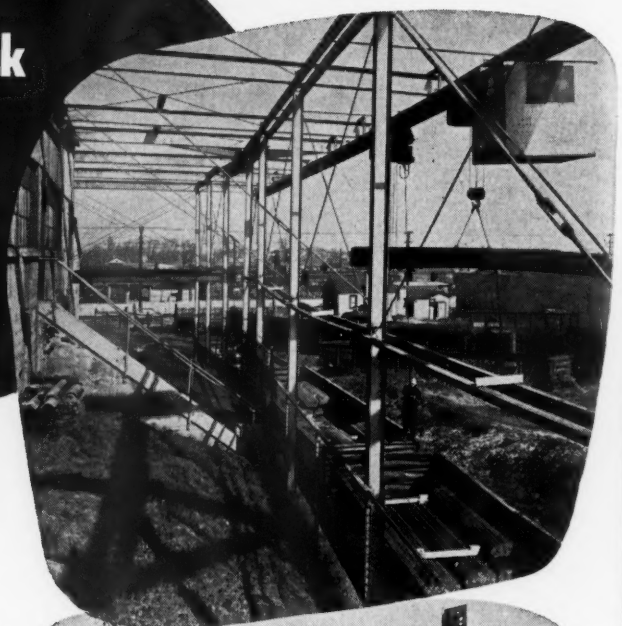
Lindberg-Fisher builds all kinds of melting and holding equipment . . . gas . . . oil . . . electric . . . induction . . . arc and high frequency. Lindberg-Fisher engineers can intelligently and without prejudice recommend the proper type of furnace to best suit your needs and conditions.

Bulletin 551 covers the complete melting line. Write for your copy today.

LINDBERG-Fisher A DIVISION OF LINDBERG ENGINEERING CO.

2453 WEST HUBBARD STREET · CHICAGO 12, ILLINOIS

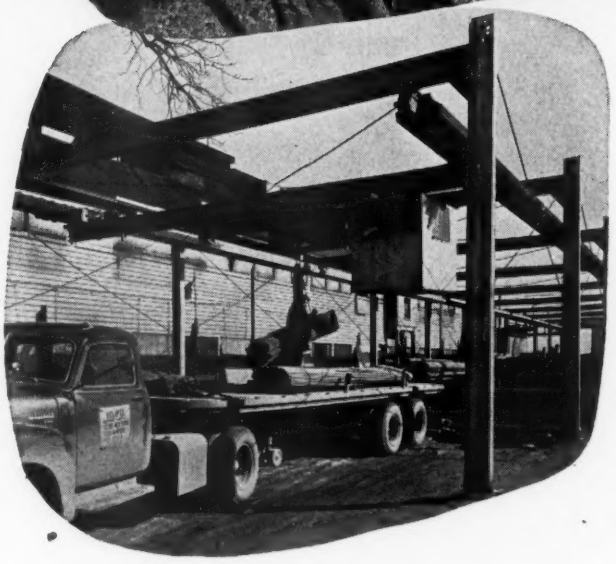
15 Tons of Bar Stock Unloaded and Stored in 30 Minutes



It takes only 30 minutes, with 3 men, to unload 15 tons of bar stock from trailer to storage yard with this 5-ton American MonoRail crane. An average of 27 tons per day from storage yard to processing, is a smooth continuing operation day after day.

This is the easiest and best way to handle bar and sheet stock because American MonoRail Overhead Handling Equipment increases production, saves labor, saves time, and cuts costs.

American MonoRail engineers will gladly show you how automatic handling pays and saves. Write today — ask for Bulletin C-1.

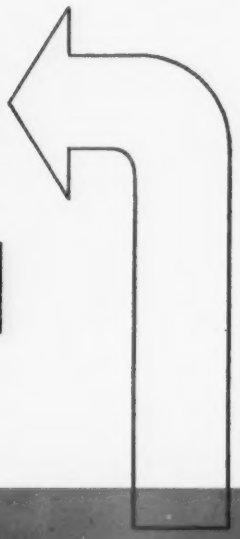


THE AMERICAN MONORAIL COMPANY

13104 ATHENS AVENUE **CLEVELAND 7, OHIO**

For Greatest Efficiency
At Lowest Cost

DESULFURIZE
with SODA ASH



For a Quality Soda Ash
At *NO EXTRA COST*

Specify

SOLVAY

TRADE-MARK REG. U. S. PAT. OFF.

DENSE SODA ASH

Especially Designed for Desulfurization

- *Medium Grain Size*
- *Dustless*
- *High Chemical Purity*

Simple, efficient, low-cost equipment for automatically feeding Soda Ash into molten iron for desulfurization is now available. We will be glad to supply detailed information concerning this equipment and its installation upon request.

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Alkalies Chemicals
70 YEARS OF SERVICE
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SOLVAY SALES DIVISION
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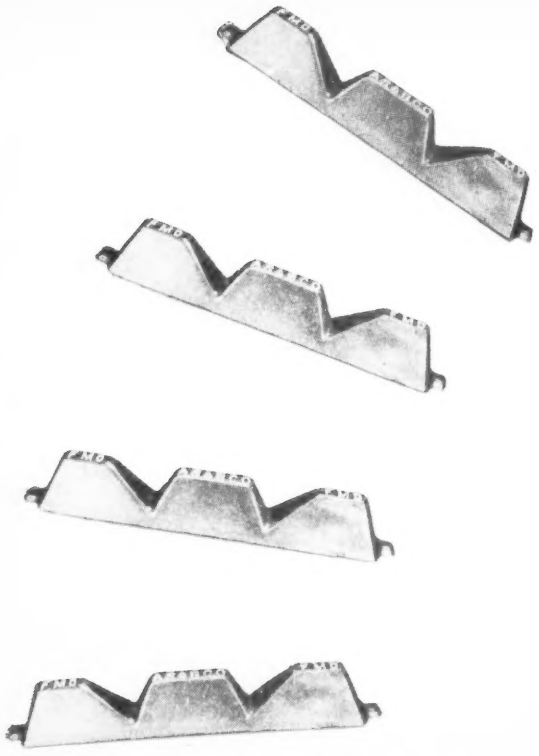


YOU and the Aluminum Situation

Once again foundries find it difficult to get exactly the aluminum alloys they want when they want them. The reasons for this are well known. Aluminum is a critical material and must go first where it is needed most.

Maybe you can help yourself in this situation . . . ask Federated for recommendations on alloys you can use successfully in place of your first choice. Often this means an even better casting, because new alloys and techniques are constantly being developed.

For example, Federated metallurgists were called to the Racine Tool and Machine Company, Racine, Wisconsin, where available aluminum alloys just wouldn't deliver the required combination of impact strength, yield strength and proportional limit in a Rail Tie-Tamper casting. Result: a new alloy was created and the casting met specifications.

The same expert service and research . . . available to all foundries . . . are especially valuable now when problems are more numerous.

As far as supplies are concerned, all we can say is that Federated is mobilized, too. More and more metal flows out of Federated's 13 plants every day. Often it is not enough and often we are not free to distribute it at will. D.O.'s come first and no-one will dispute this necessity.

For technical and practical metallurgical help in solving aluminum alloy problems . . . and in conserving critical materials . . . write Federated. Department E.

Federated Metals Division

Federated first in the non ferrous field FMD

AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N.Y.

Rams 27 cu. ft. of sand per minute with help of TIMKEN® bearings

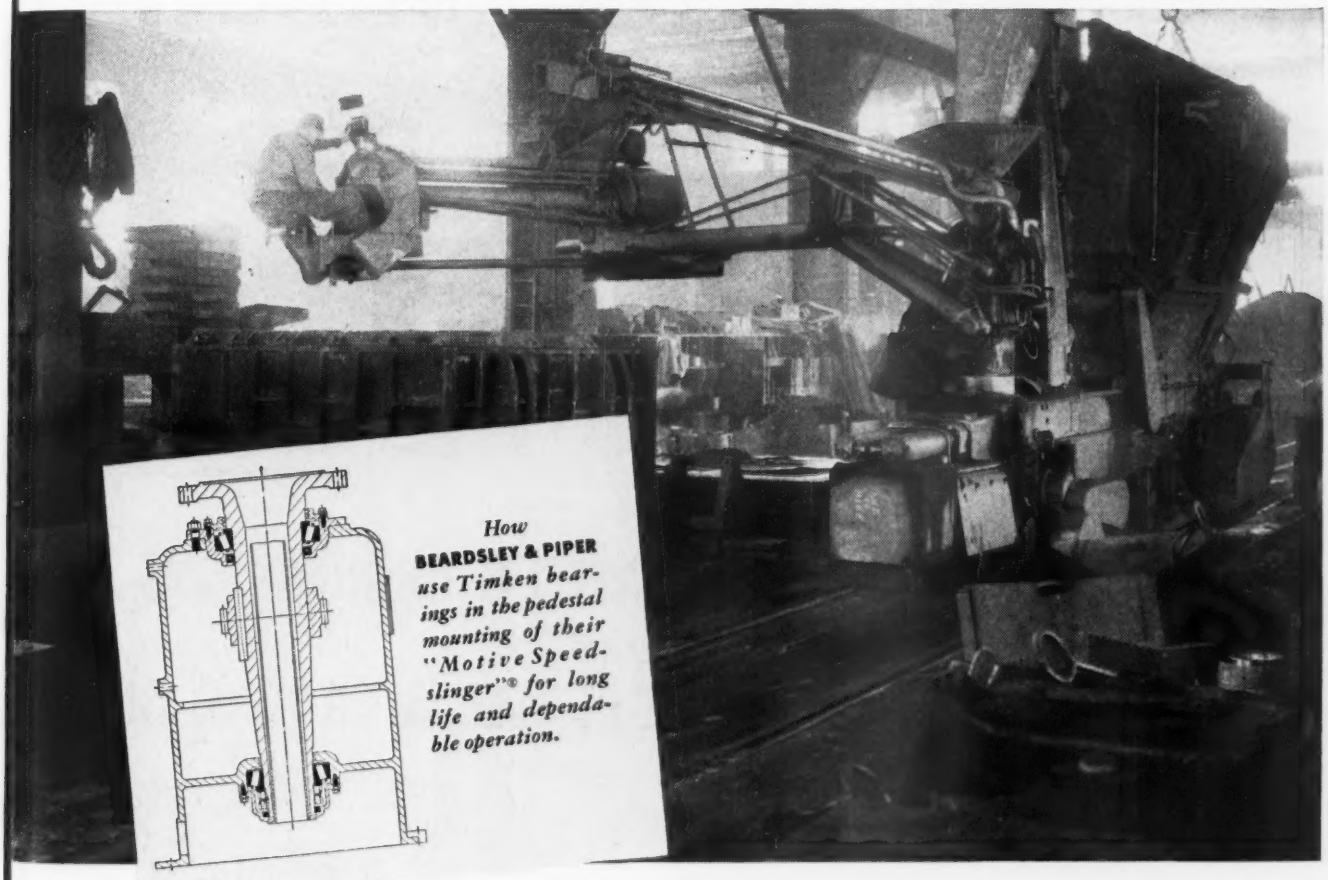
THE Beardsley & Piper "Motive Speedslinger"® rams up to 27 cu. ft. of sand per minute into molds of any size. Carrying its own sand in a 400 cu. ft. tank, it is reported to have the largest capacity and the greatest range of operation of any mechanized molding device. With Timken® tapered roller bearings in the wheels and pedestal mounting of the ramming pivot, foundries are assured of long, trouble-free performance.

Line contact between the rollers and races of Timken bearings provides extra load-carrying capacity. And because of their tapered construction Timken bearings take both radial and thrust loads in any combination. That's why they can handle the heavy overhung load of the ramming apparatus.

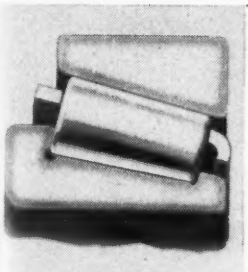
Since Timken bearings permit tighter lubricant-retaining closures, foundry dust is kept out, lubricant kept in. The rollers and races of Timken bearings are case-carburized to provide hard surfaces and tough cores. That means extra resistance to wear and shock. Timken bearings are precision manufactured and since they're made of the finest steel ever developed for bearings—Timken fine alloy steel—they normally last the life of the machine.

No other bearing can give you *all* the advantages you get with Timken bearings. Make sure they're included in the foundry machinery you build or buy. Always look for the trademark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **BEARDSLEY & PIPER** *use Timken bearings in the pedestal mounting of their "Motive Speedslinger"® for long life and dependable operation.*



GREATER LOAD AREA

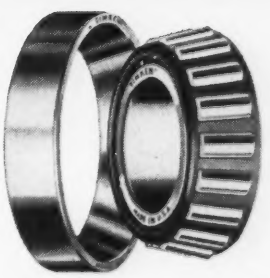
Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

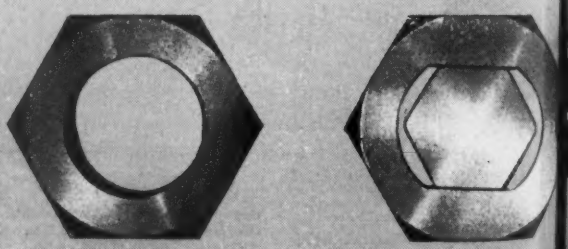


NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◫ AND THRUST ⟷ LOADS OR ANY COMBINATION

When ready to order
flask and pattern plate
pins and bushings . . .

please remember—
thirty years ago
HINES designed and
produced the first

HARD-CHROME PLATED & GROUND PINS
and
HARDENED, HARD-CHROME PLATED & GROUND BUSHIN



THE HINES
3431 WEST 140th STREET

HINES

manufacturers of the original,
the finest and most economical,
flask and pattern plate pins and
bushings. Write for sizes and prices.

INSTALLATION TOOLS

The counterboring tool and wrenches are the only tools needed for an installation of Hines Pins and Bushings

FLASK CO.

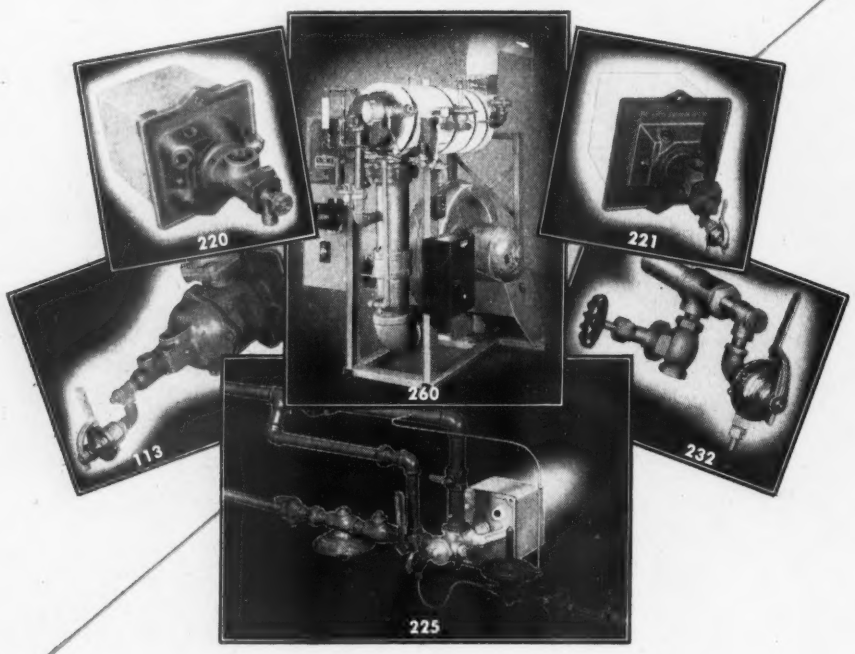
CLEVELAND 11. OHIO

Peak Efficiency **either** *Gas or Oil*

with

North American

Dual-Fuel Burners*



THE LINE IS *Complete*.....SELECT

THE BURNER YOUR OPERATING CONDITIONS REQUIRE

113—Long Flames. **220-221**—Short Flames, sealed-in mountings. **225**—For rugged duty, open or closed mounting, gas at zero. **232**—Compressed air atomizing oil inserts. **260**—Oiltogas Converter for burning oil as a gas in existing gas burners.

*Dual-Fuel: The North American name for burners designed especially for both gas and oil. Fuel changed by merely turning valves.

THE NORTH AMERICAN MANUFACTURING COMPANY

MANUFACTURERS OF INDUSTRIAL FUEL BURNING EQUIPMENT FOR GAS OR OIL

BRANCH OFFICES *with* FIELD ENGINEERS *in* PRINCIPAL CITIES

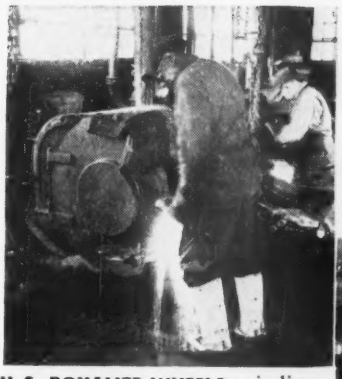
CLEVELAND 5, OHIO

How Does U. S. Rubber make it easier to grind manganese?

U. S. ROYALITE WHEELS are used by this customer to smooth and clean up casting of crusher jaw.

By developing wheels especially designed to be used on manganese, U.S. Rubber technicians make it easier to handle this extremely tough steel.

Bring your questions on grinding wheels to "U.S." engineers. They will make sure you receive properly engineered wheels in which you can have complete confidence.



U. S. ROYALITE WHEELS grinding pug mill knives.

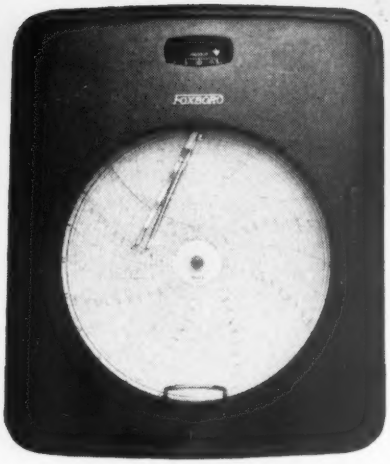
U. S. ROYALITE® WHEELS are used to grind throat liners.

PRODUCT OF U.S.RUBBER SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

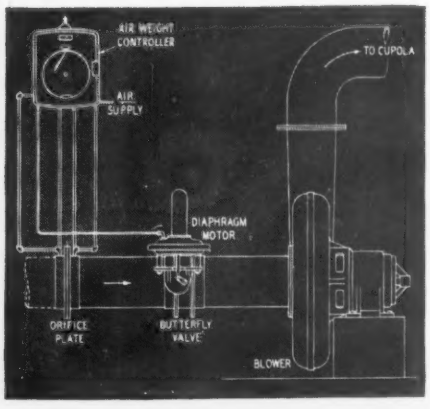
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

4 SHORT CUTS TO FOUNDRY COST REDUCTION



New Model 40 Air-weight Controller

— designed for today's higher operating pressures, increased production rates, mechanical charging, and variable material sizes.



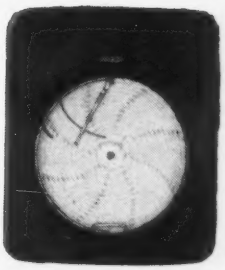
1 *Save Pigging—Save Fuel—Save Rejects with FOXBORO AIR WEIGHT CONTROL*

Here's a simple way to effect important savings in cupola operation. The Foxboro Air Weight Controller accurately controls the blast by *weight* of air . . . supplies precisely the correct amount of oxygen for the coke charge. It automatically compensates for variations in atmospheric temperature and pressure . . . makes every day a good pouring day! That means better combustion, more uniform heats and uniformly better castings. And you save the time and fuel wastes of needless pigging. Over 1300 cupolas are now equipped with Foxboro Air Weight Controllers.

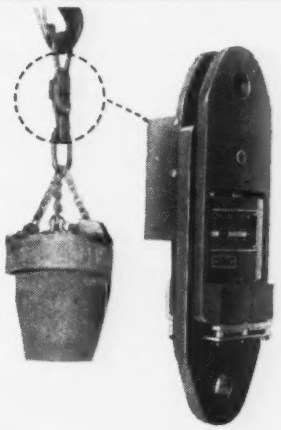
FACTORIES IN THE

2 *Stop cupola troubles before they start, with the FOXBORO WINDBOX PRESSURE RECORDER*

Continuous pressure records provided by this instrument enable operators to keep tabs on cupola conditions. They immediately reveal any blast restrictions, such as clogged tuyeres or bridging over of the charge . . . save production losses by permitting prompt correction of the trouble. Proven in hundreds of foundries, the simple sturdy Foxboro Windbox Pressure Recorder can help cut costs on any cupola.

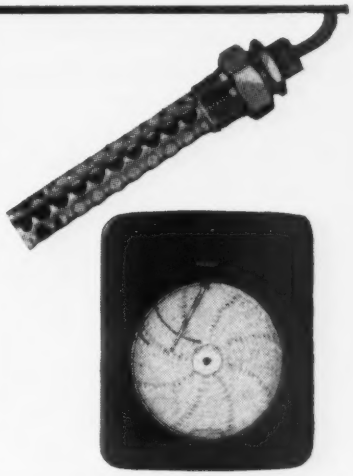


3 *Eliminate double handling in weighing materials with the FOXBORO CRANE WEIGHT RECORDER.* Save time and work in weighing cupola charges and other foundry materials being loaded or unloaded. The Foxboro Dynalog Crane Weight Recorder, in conjunction with the Foxboro-Baldwin Force Cell, (shown at right), measures and records the weight while the materials are on the crane. Assures quick, accurate weighing by the simple reading of an instrument conveniently located.



4 *Keep dew point constant in blast air, with the FOXBORO BLAST HUMIDITY RECORDER OR CONTROLLER.* A Foxboro Dewcel*, in conjunction with a Dynalog Recorder, makes a continuous, accurate record of the blast air dew point. With a Controller, either a constant high moisture content can be maintained very simply (by control of steam or water spray), or dehumidifying equipment can be controlled to maintain constant low dew point. Simple to install, dependable in operation, moderate in cost. Foxboro's unique Dewcel is illustrated at right, with the Dynalog Recorder.

*TRADE MARK



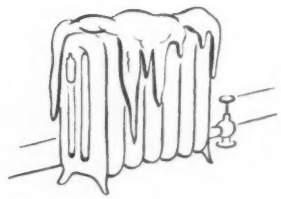
WRITE FOR DETAILED BULLETINS

on these 4 foundry aids, or information on other Foxboro Instruments for better control of: Core oven temperatures — Sand dryer temperatures — Plant air system pressures — Annealing and normalizing temperatures — Plating and cleaning bath temperatures. **The Foxboro Company, 326 Neponset Ave., Foxboro, Mass., U. S. A.**

INSTRUMENTS BY

UNITED STATES, CANADA AND ENGLAND

FOXBORO
Reg. U. S. Pat. Off.

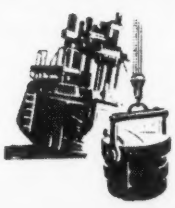


...rapid radiation-slower burninq
...like INTERNATIONAL GRAPHITE ELECTRODES

INTERNATIONAL *Graphite & Electrode* **CORP.**

A SPEER CARBON COMPANY SUBSIDIARY

ST. MARYS, PENNSYLVANIA



Model CH-20 Truscon Power Handled Flask.

Model CH-40 Truscon Flask for Extra Heavy Duty.

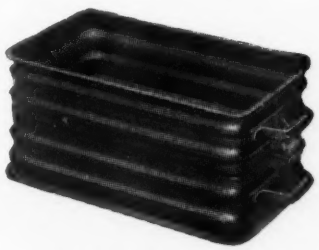
HEADQUARTERS
FOR STEEL FOUNDRY FLASKS

THE SUCCESS of modern foundry methods depends upon the speed and economy with which molding operations can be handled.

Truscon's Pressed Steel Division—nationally known for the quality of its products and the dependability of its service—is fully equipped and prepared to handle your foundry flask requirements. The Pressed Steel Division's central location assures efficient service for your needs. Write for free catalog describing the complete line of Truscon Steel Foundry Flasks.

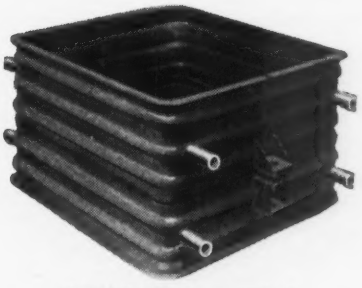
TRUSCON
STEEL COMPANY
PRESSED STEEL DIVISION
6100 TRUSCON AVE. • CLEVELAND 4, OHIO
Subsidiary of Republic Steel Corporation

Model OM-1 Truscon Flask for One-Man Handling.

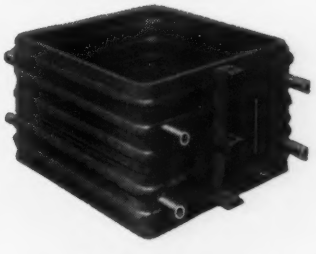


Model OM-4 Truscon Flask for One-Man Handling.

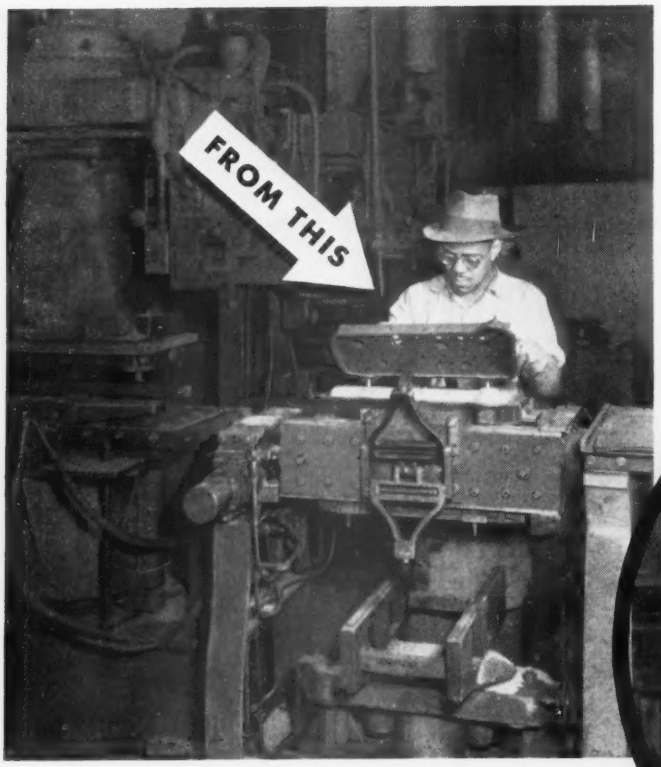
Model TMR-60 Round Truscon Steel Flask for Two-Man Handling.



Model TM-10 Truscon Flask for Two-Man Handling.



Model TM-12 Truscon Flask for Two-Man Handling.



Power-Rollover . . .
Automatic Draw

It's All Automatic!

SUTTER Automatic Core Draw Machine

From the time the core dryer is placed on the core box until the drawn core is resting on the draw table, the Sutter Automatic Core Draw Machine provides completely automatic cycle. All the operator does is place the dryer in position and push the start button . . . the dryer is clamped, the core box rolls over, the draw table rises to the core box and lowers to rest position without any attention from the operator. Meanwhile he is free to blow another core . . . free of the fatigue that normally accompanies manual rollover and draw operations. Output is upped from 300% to 400%.

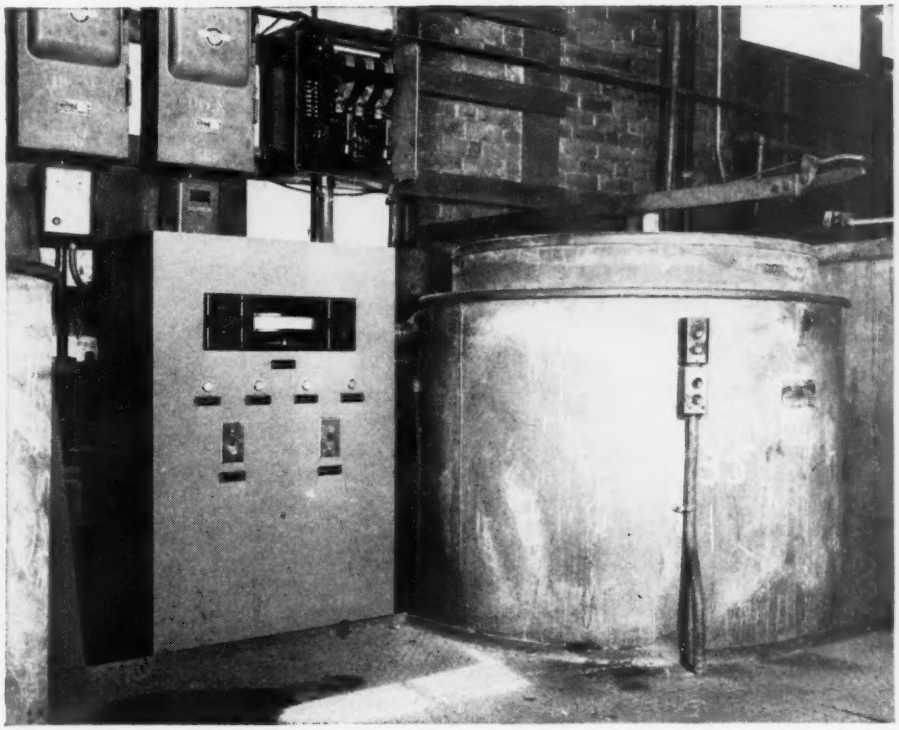
There are other benefits, too. Since every core is drawn uniformly, even unskilled labor can maintain top output on the most complicated cores with minimum rejections. Placed next to a core blower (on either the right or left side) one operator performs both blow and draw operations.

Sutter Automatic Core Draw Machines with Power-Rollover are built in two standard sizes for most foundry applications—special units designed for the unusual problem. Complete information is contained in Sutter Bulletin "F". Send for it today.

SUTTER

SUTTER PRODUCTS CO.
2005 WESTWOOD AVE. • DEARBORN, MICH.

PRECISE TEMPERATURE CONTROL FOR COSTLY HEATING LOADS



PYROMETER EQUIPMENT

Type HP-3 ON-OFF pyrometer controller being used with a 25-inch air-draw furnace

Expensive loads in industrial heating furnaces are closely controlled with the new General Electric pyrometer equipment. Any change in furnace temperature equivalent to 1/10 of 1 per cent of full scale starts immediate control action when the furnace has come up to temperature. Furthermore, normal changes in humidity, ambient temperature, and voltage do not have a significant effect on the preciseness of control operation.

G-E controlling pyrometers have other features: Micrometer-type setting mechanism allows exact set-point adjustment. Dual set-points of three-position controllers can be fixed independently at any two values throughout the full-scale range. Built-in cold-junction compensation of the thermocouple prevents changes in ambient temperature at the instrument from appreciably affecting performance. And thermocouple-break protection automatically removes the load on a furnace in the event of a break in the thermocouple circuit.

This new equipment is made in indicating, protecting, and two- and three-position control forms. It is available in a variety of standard temperature ranges in the 0–3000 F span. For more details about these process instruments, get in touch with your nearest General Electric representative; or write for Bulletin GEC-713, "G-E Indicating and Controlling Pyrometers." Your local G-E salesman can also tell you about the complete line of thermocouples offered; information will be supplied if you write for Bulletin GEC-714, "G-E Thermocouples, Components, and Accessories." General Electric Co., Schenectady 5, N. Y.

General Electric's pyrometer line consists of flush- and surface-mounted indicators, controllers, and protectors. Shown above is a Type HP-3 two-position indicating controller

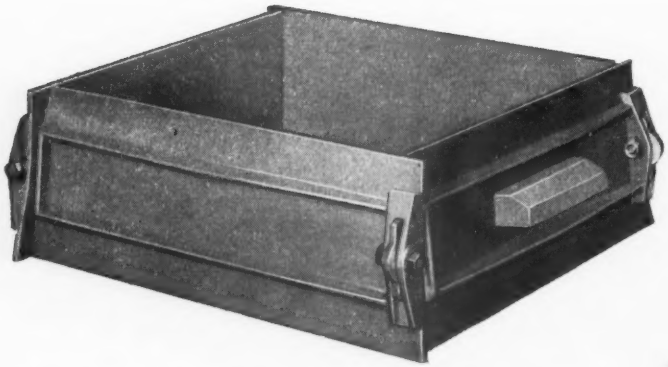
GENERAL ELECTRIC

602-207

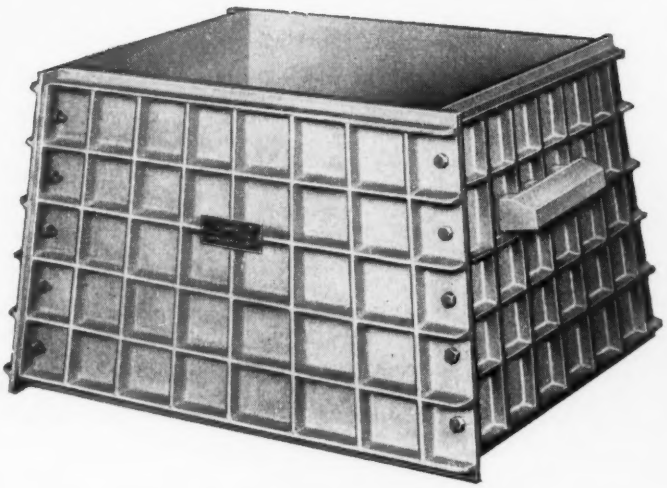
A COMPLETE LINE TO CHOOSE FROM . . . . .

DIAMOND

Aluminum, Grey Iron and Steel Jackets



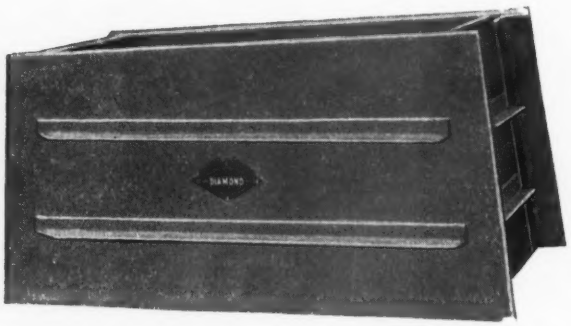
Diamond Flexible Type Jacket. This jacket is ideal in Foundries using Flasks of a variety of degrees in taper. Will fit perfectly any degree of taper from 3° to 6°, supporting the mold on all sides with equal pressure. Will also fit old flasks that are not perfectly square. Jacket made in cast iron or aluminum.



Diamond Solid Type Jacket in Cast Iron or Aluminum. Made in aluminum for foundries desiring a light weight but sturdy jacket for medium weight castings.

Made in cast iron for heavy duty iron and steel castings.

All jackets are assembled on special designed templates in 3°, 4°, 5° tapers and are guaranteed to fit correctly.



This is the widely known DIAMOND Steel Jacket used by foundries since 1908. Thousands are in use today.

DIAMOND

Telephone 2553 **CLAMP AND FLASK COMPANY** Richmond, Indiana

Designers of **CORE PLATES, JACKETS, BANDS, FLASKS** *since 1889*

Well, I've tried 'em all -but I'll take DIXON'S!

You can't fool an experienced foundryman. Sometimes claims for crucibles may sound good to him... but it doesn't take him long to put a few crucibles into service and see for himself!

That's why we're always glad to have you test a Dixon "Carbond" Crucible.

So, when a Dixon salesman suggests to you, "Try a couple of Dixon Carbond Crucibles; *see for yourself* how many heats you get out of them, how clean they keep on the inside, how well they take the heat—and hold it too"... TAKE HIM UP ON HIS OFFER.

Remember, Dixon's Research and unequalled experience of over a century assure you of the last word in BALANCED crucible performance.

DIXON PRODUCTS

Crucibles
Stoppers
Refractory Cements
Base Blocks
Pre-formed Furnace Linings
Furnace Covers
Ladle Liners
Specialties

JOSEPH DIXON CRUCIBLE COMPANY

JERSEY CITY 3, NEW JERSEY

DIXON'S CRUCIBLES EXCELLENCE D SINCE 1827 STOPPERS & REFRACTORIES

Over a Century of Experience **SPELLS THE DIFFERENCE**

Moline Malleable now makes larger and more complex cores with THERMEX *Core-baking Equipment than were possible with their former equipment. This progressive company reports that* THERMEX *Core-baking Equipment "brings about the most important improvement in core-baking operations in years."*

Thermex
ELECTRONIC CORE-BAKING EQUIPMENT

"pays for itself in less than a year"

—MOLINE MALLEABLE IRON CO.

A partial list of companies who have purchased THERMEX Electronic Core-baking Equipment

American Hardware Corp.
Brugger Manufacturing Co.
Crane Company
Ford Motor Co.
Grand Haven Brass Foundry
Grinnell Company, Inc.
Moline Malleable Iron Co.
National Malleable & Steel Castings Co.
Ontario Malleable Iron Co.
Phoenix Brass Fittings Corp.
Ronci Company
Sterling Faucet Company
United Foundries, Inc.
United States Pipe & Foundry Co.

"WE ESTIMATE," states Moline Malleable Iron Co. of St. Charles, Ill., "that our new THERMEX Core-baking Equipment will pay for itself in less than a year. We have just placed an order for a second THERMEX installation." Here's why:

- **Labor costs have been cut drastically, in the baking department, and in the core-making department as well.**
- **Utility costs per ton of sand have been cut more than 50%.**
- **Only one-fourth the floor space of conventional baking equipment is needed —freeing this space for other work.**
- **Core rejects have been reduced 66%.**

Why not take advantage of the labor-saving, cost-cutting advantages of THERMEX Core-baking Equipment? Girdler manufactures dielectric core-baking equipment in capacities from ½ ton to 15 tons per hour. For complete data write The Girdler Corporation, Thermex Division, Louisville, Kentucky.

THERMEX—T. M. Reg. U. S. Pat. Off.

THE GIRDLER CORPORATION
Thermex Division

USCO D-3

USCO D-3 is a 4% Si—3% Cu sand casting Aluminum Alloy . . . produced from raw materials to finished ingot under our precision Production Control System.

USCO D-3 Aluminum Alloy has excellent foundry characteristics . . . insuring you of ease of melting and pouring . . . giving you gas and dross free castings. With USCO D-3 you can produce dependable, heat-treatable castings with good machinability.

The USCO stamp on your aluminum alloy ingot is a guarantee of time-tested quality. Why not join our hundreds of satisfied customers?

FREE Send for your copy of the USCO Aluminum Alloy Selector. A handy aid to analysis, specifications and many other foundry problems.

For 47 years, pioneers in aluminum development.

USCO

ALUMINUM

U. S. REDUCTION CO.

East Chicago, Indiana

..blowing non-flowable sand on San-Blo

THE OHIO FOUNDRY COMPANY
CLEVELAND, OHIO

April 30, 1951

The Federal Foundry Supply Co.
4600 East 71st Street
Cleveland 5, Ohio

Gentlemen:

Your revolutionary new San-Blo core blower has prompted me to write this letter telling of my complete satisfaction, and how pleased I am with its performance.

Most foundries have experienced the difficulties in attempting to blow a decidedly non-flowable, high green strength, high moisture sand. Sands with these properties are advantageous in a great many cases, but due to their piping tendencies, they were impractical to blow. With the introduction of your San-Blo core blower, flowability, green strength and moisture are no longer important factors in core blowing.

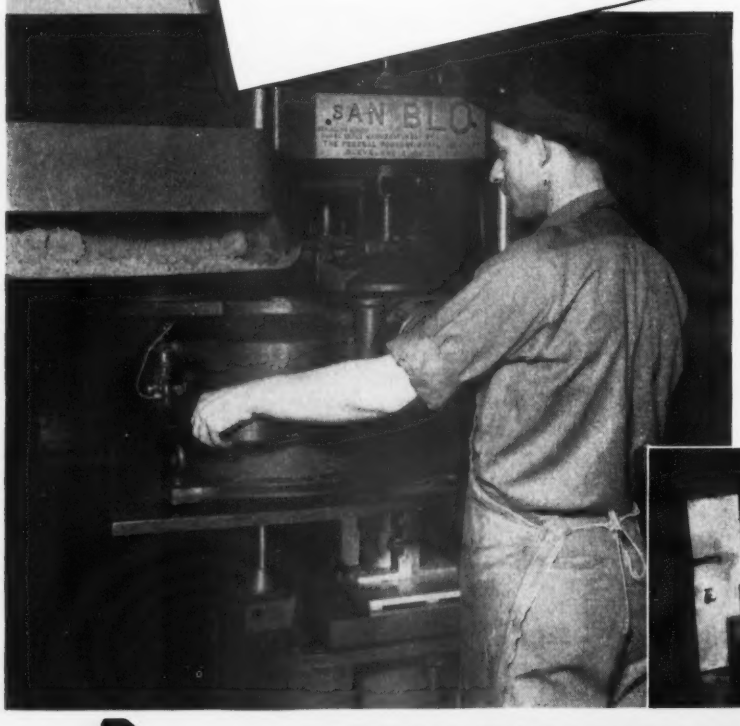
To cite an example of what your core blower has done in our coreroom, the core for a transformer insulator base had to be rammed by hand because it could not be blown on a conventional type core blower, due to sand piping in the blowhead. This core is 8 inches high, with a base that measures 6 inches. The sand used tested 6% moisture and 6 pounds green strength. On a conventional type core blower, the core box would not fill up. This core is now being blown on your San-Blo core blower very easily and rapidly. The cores are well packed and accurate, and what was once impractical, has now become routine.

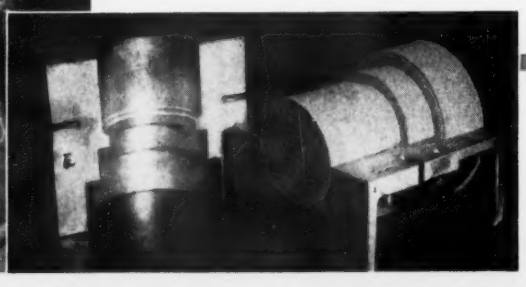
The flexibility and simplicity of operation of the San-Blo core blower makes it unique in its field and helps us meet today's demand for high speed production, and also reduces costs.

Very truly yours,
THE OHIO FOUNDRY COMPANY
Ernest Thomas
Ernest Thomas
Core Room Superintendent

ET:LJ

Ernest Thomas, Core Room Superintendent of The Ohio Foundry Company, Cleveland





• Like other progressive foundries using the new San-Blo, Ohio Foundry is moving more and more core boxes off benches and blowing them in their San-Blo. That's because non-flowable sand can be blown successfully in the San-Blo. Cores previously rammed, because core mixture could not be blown, are now easily and quickly produced on the San-Blo.

For full information on this remarkable, new core blower, write for Bulletin CB-2.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The FEDERAL F
4600 EAST 7 EE
CHICAGO • DETROIT • MILWAUKEE • YOR

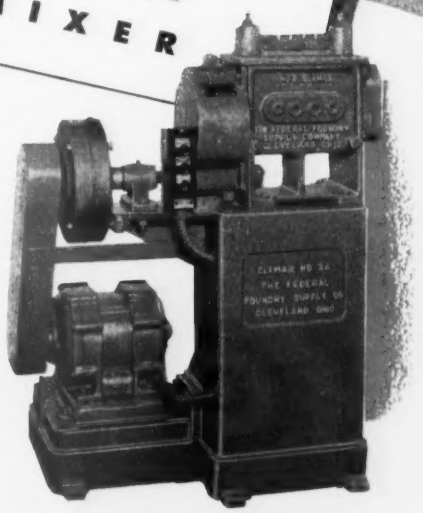
small in size..

BIG producer

Batch size—3 cu. ft. Discharge door 28" off floor to accommodate a 3 cu. ft. wheelbarrow.

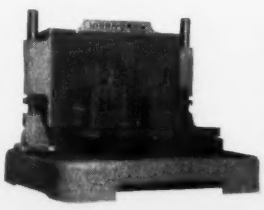
WHIRLMIX SAND MIXER

You can do a lot of mixing with the new Whirlmix, despite its small size—up to 4000 lbs. of core oil or facing sand per hour. Weighs only 1060 lbs., foundation unnecessary, easily moved. Flexible, spring steel arms mix thoroughly, but won't overheat or crush sand grains. Write for full information.



CLIMAX WIRE STRAIGHTENER

If you're having trouble getting wire—here's the solution. With a Climax, you can reclaim used wires and rods. Easily and safely operated by unskilled labor. Six models give you choice of drives and wire sizes. Send for bulletin.



Nothing like Vibra-Draw for easy, fast core drawing. The vibrating head does it—experience isn't necessary. A perfect core every draw. The perfect teammate for a San-Blo.

The Lowe portable, electric sifter features greater shoveling room and screening area for faster sifting. Rugged construction. Enclosed ball-bearing motor.

Here's the sprue for squeezer-made molds. Squeezes down with sand, pops up when squeezer board is removed. Leaves completed, properly located pouring sprue.

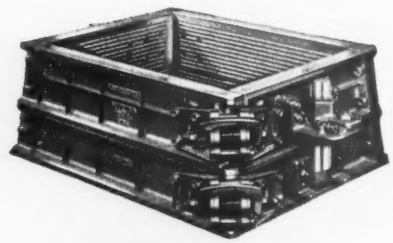
FOUNDRY SUPPLY Company

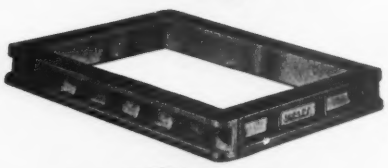
7[illegible]EET • CLEVELAND 5, OHIO

• [illegible]TORK • CHATTANOOGA • RICHMOND, VA. • LOS ANGELES

THE WINNING COMBINATION

10" Post Type
Universal
Jolt Squeezer
Portable Type





ADAMS UNIVERSAL JOLT SQUEEZERS

EQUALLY efficient as jolt-squeeze-pattern-draw machines or plain jolt squeezers, these simply designed production units will reduce production costs and minimize rejects. Their operation is so simple and easy that no special skill is required to maintain uninterrupted high production levels. Available in both post and side rod types, stationary and portable.

ADAMS CUSTOM-BUILT FLASK EQUIPMENT

When you use Adams Flask Equipment you are assured the superior performance that means peak production. Adams Cherry Slip Flasks or Cherry Snap Flasks used with Adams Cast Iron, Aluminum or Steel Jackets are a combination hard to beat for accuracy, convenience and economy. Remember — all Adams Flask Equipment is made by experienced craftsmen to your exact specifications.

WRITE FOR descriptive literature detailing the production-boosting features of Adams foundry equipment line. THE ADAMS COMPANY, 800 Foster St., Dubuque, Iowa.

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

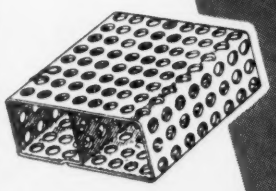
DUBUQUE, IOWA, U.S.A.

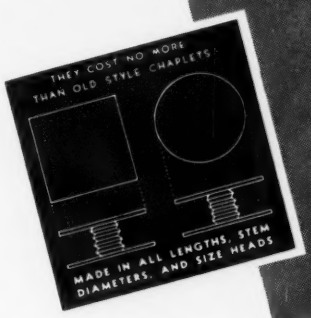
WE HAVE SERVED THE FOUNDRY TRADE FOR *Over 30 Years*

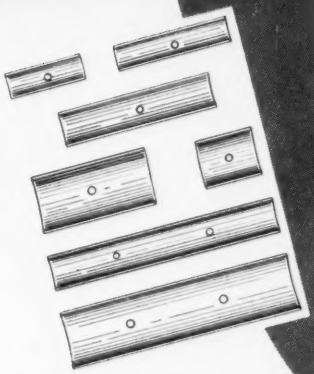
CHICAGO CHAPLETS and CHILLS

always UNIFORM *and* DEPENDABLE....

IN SIZE AND QUALITY!







Adequate Stocks
ALWAYS MAINTAINED

PROMPT DELIVERIES

FULL COOPERATION IN
Solving YOUR Problems

Write for Catalog
Covering our most complete line of Chaplets, Chills and other allied products

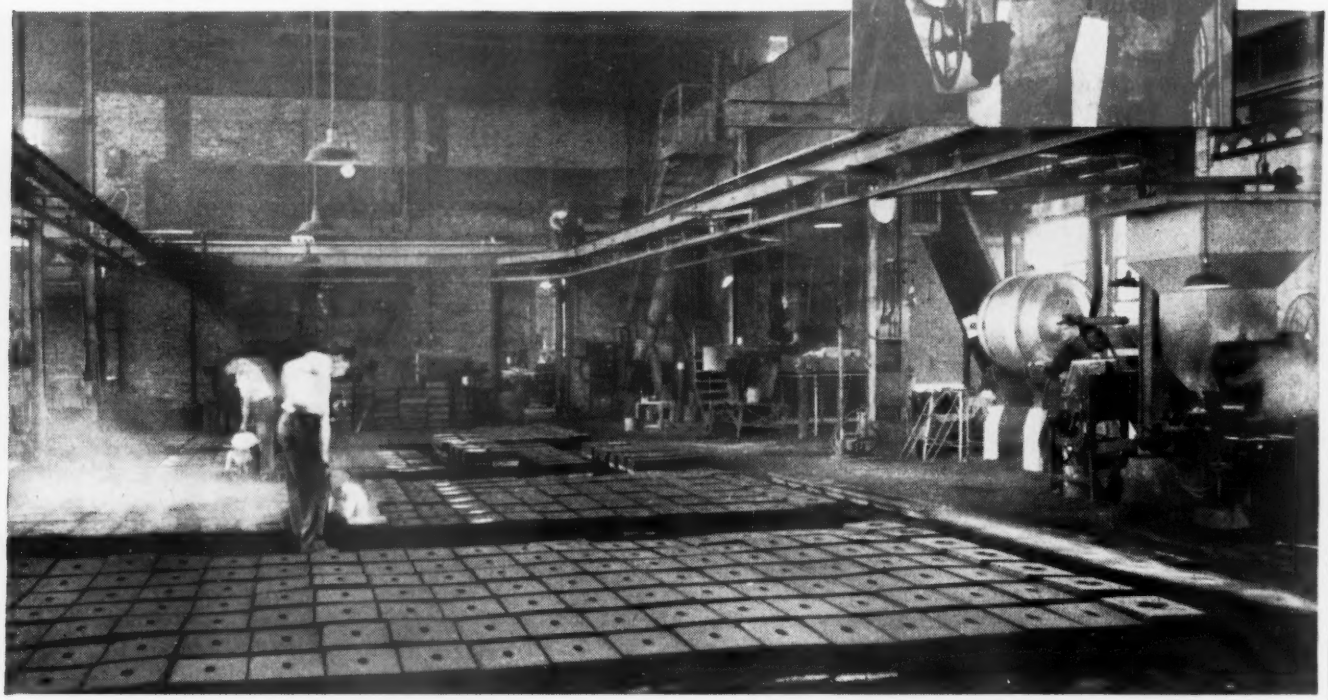
Chicago CHAPLET COMPANY

2047-2059 NORTH WOOD STREET • CHICAGO 14, ILLINOIS

Borings Wanted...

as is

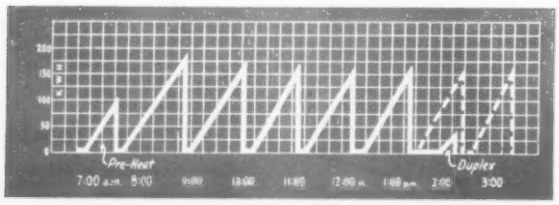
Detroit Rocking Electric Furnace, purchased to remelt borings from concern's own machine shop, proved so fast and efficient that the company buys borings outside to keep furnace working. Borings used as is, not briquetted.



Machine shop to melting furnace to molds . . . an efficient operation using DETROIT ROCKING ELECTRIC FURNACE

Here's another example of improved foundry operation with Detroit Rocking Electric Furnaces.

At Standard Automotive Parts Company, the Detroit, started the same time as the cupola, cold melts until the cupola is ready to tap. They usually have six cold heats, then cold cupola iron is put into the Detroit Electric Furnace, heated, and poured into molds. Furnace used, with excellent efficiency, about 80% unbriquetted borings.



Operating graph, Type LFY, 175KW, 700 lb. Detroit Electric Furnace, melting gray iron. Charge, 600 lbs. Total metal, 4200 lbs; total KWH, 1296; av. power consumption, inc. preheat, 617 KWH/ton; total hours operation, 8½; av. melt time, 59 mins.

For ferrous and non-ferrous metal melting, Detroit Furnaces are fast, make optimum use of power, produce metal of uniformly high quality, achieve lowest metal loss by shrinkage.

Send your production data. Our engineers will furnish facts on how Detroit Electric Furnaces will fit into your operations.

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

Foreign Representatives: In BRAZIL—Equipamentos Industrias "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Casco, S. de R. L. Atenas 32, Despacho 14, Mexico City, D. F.

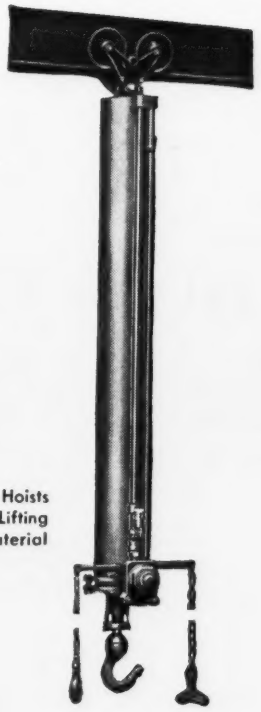
IT'S IMPORTANT

To SAVE MAN HOURS
REDUCE PRODUCTION COSTS
INCREASE PLANT EFFICIENCY

That's Why It Will Pay You to Investigate

CURTIS

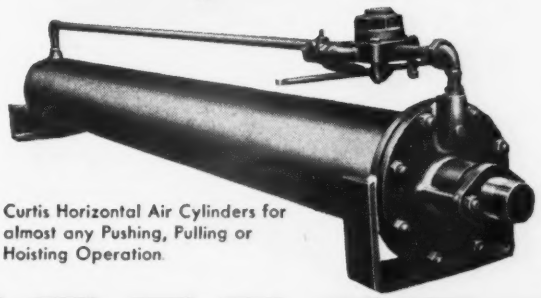
AIR COMPRESSORS
AIR-OPERATED CYLINDERS & HOISTS



Curtis Vertical Air Hoists Provide Low-Cost Lifting or Lowering of Material or Machines.

Curtis Model F Air Compressors are available as either electric or gasoline motor-driven units (electric motor-driven portable or stationary). Up to 10 H.P.

Model C Water-Cooled Compressors, up to 50 H.P. Fully Enclosed — Dust and Dirt Proof — Carbon-free Valves. Timken Bearings.



Curtis Horizontal Air Cylinders for almost any Pushing, Pulling or Hoisting Operation.

I-51-1

Throughout the world, Curtis equipment has stood the test of time, because it is precision made from top quality raw materials with 97 years of "know how."

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1922 Kienlen Ave., St. Louis 20, Mo.

I am interested in items checked below:

☐ **AIR HOISTS**
Stroke? ☐ Capacity? ☐

☐ **AIR CYLINDERS**
Stroke? ☐ Capacity? ☐

☐ **AIR COMPRESSORS**
Capacity? ☐ Pressure? ☐
Current? ☐

Name.....

Firm.....

Street.....

City.....Zone.....State.....

Remove Industrial Contaminants Successfully and ECONOMICALLY

You know that national, state and local air regulations are becoming more stringent annually. Air cleaning equipment, has progressed to a degree of perfection unknown a few years ago. Buffalo Forge Company, working on actual installations as well as in the laboratory presents a diversified line of ECONOMICAL - -

"Buffalo" AIR CLEANING EQUIPMENT

Backed by more than fifty years of air washing experience, we now offer wet-type air cleaning devices for contaminants which are toxic, erosive, corrosive or just a nuisance. All "Buffalo" equipment is designed to provide maximum efficiency, with ease of handling and operating, together with moderate initial cost and low maintenance cost.

5 PROVEN TYPES—

Because no one type of cleaner will meet all conditions successfully, we have available 5 different wet types—all PROVEN in actual operation in industry. In addition to individual applications, they are sometimes used together. They are:

Send for Bulletin 3181-B describing the 5 types of Industrial Air Cleaning Equipment—No obligation.

1. **The Air Washer Group—Static Washer, Wet Cell, Combination, and Triple Bank Washer**
2. **Hydro Volute Scrubber**
3. **Cupola Washer**
4. **Hydraulic Scrubbing Tower**
5. **Multistage Gas Scrubber**

No matter what your contaminant—dust, fume, gas, vapor mist smoke or fog, our past experience will be valuable to you in selecting the proper equipment or combination to do a first class removal job. Remember, we are interested in the most economical way to handle your problem. So are you—

Let our Engineers make specific recommendations!

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

221 MORTIMER ST. BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

VENTILATING FORCED DRAFT | AIR WASHING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT PRESSURE BLOWING | EXHAUSTING

Yes . . . WE WANT TO SELL Volclay AND Panther Creek BENTONITE

. . . but more important, we want you to get the most out of them!

Mr. Foundryman • Our job doesn't end with shipping bentonite. More important, we are interested in the proper use and selection of bentonite as related to your particular molding problems.

Some foundries use straight Volclay (western bentonite). Others use only Panther Creek (southern bentonite). *An increasing number are finding that best results are achieved with a combination of the two!*

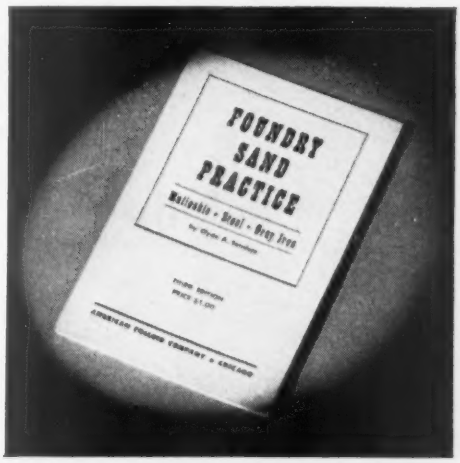
Compared with using straight western bentonite, blends of Panther Creek and Volclay will in most cases increase flowability (less ramming), give an easier shakeout, and still maintain adequate dry strength.

In addition to improving workability of the sand and reducing labor costs, the over-all bentonite cost is less because freight rates on Panther Creek are lower to most points.

Please write us if you would like further information on possible improvement in your sand practice through the use of Panther Creek southern bentonite in combination with Volclay western bentonite.

Helpful Book Free to Foundrymen

If you'd like a copy of "Foundry Sand Practice" by Clyde A. Sanders, send us a letter or post card. It will be mailed to you at once without charge.



American Colloid Company

PRODUCERS OF HIGHEST QUALITY BENTONITE SINCE 1927

Merchandise Mart Plaza
Chicago 54
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WHEN YOU WANT **GREAT STRENGTH** WITH LIGHT WEIGHT..

Insist on FRONTIER 40-E ALUMINUM ALLOY

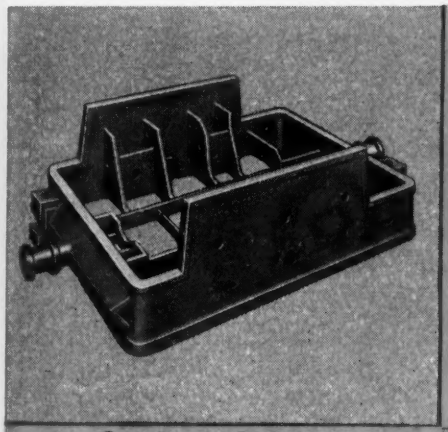
Metals must meet rigorous demands in a variety of industries in these days of stepped-up productivity. FRONTIER 40-E Aluminum Alloy possesses special properties that assure you excellent production results. Combining lightness and strength with excellent machineability, 40-E Alloy may be used in unlimited industrial applications. Requiring no heat treatment and keeping uniform test bar quality throughout large castings, it may be used in strong truck axles or precise aircraft defroster parts. Product performance is better with FRONTIER 40-E Aluminum Alloy. Investigate its possibilities now.

WRITE TODAY FOR FREE DATA BOOK AND FULL DETAILS ABOUT FRONTIER 40-E ALUMINUM ALLOY

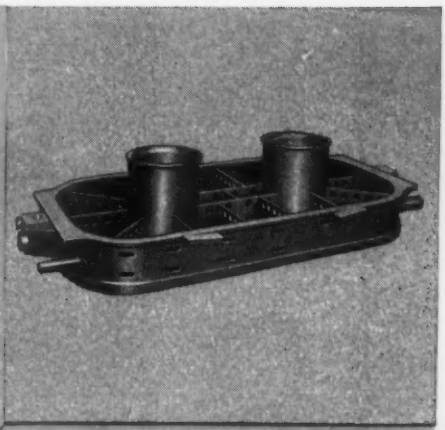
FRONTIER BRONZE CORPORATION

4878 PACKARD ROAD, NIAGARA FALLS, NEW YORK

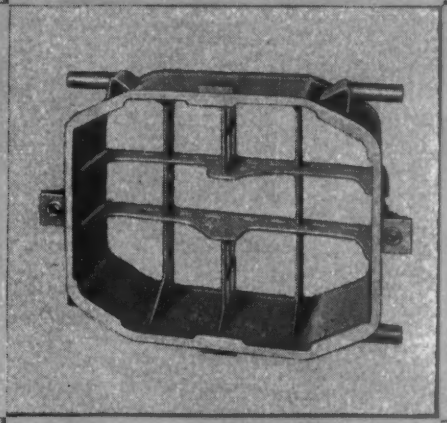
TYPICAL *Industrial* Standard Fabricated Flasks



Foundry efficiency demands unusual shapes and sizes for economical production

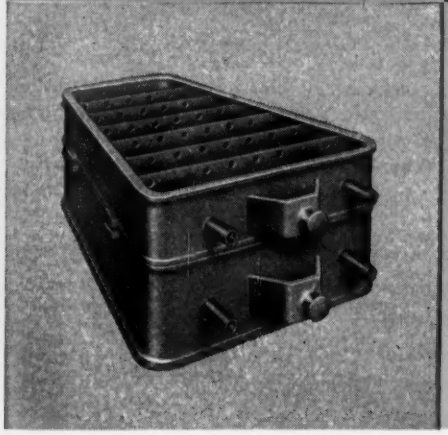


Cut-Away Cylinder Block Flask



Twin Stack Converter Housing Roll-Off Flask

"A" Type Tool Base Flask



Octagon Shaped Flask

Industrial is equipped to engineer and build fabricated flasks to your standard and special requirements.

Round Wheel Flask with Pouring Lips

Special Flasks at Standard Prices

Write for our Catalog

I.F.I.

INDUSTRIAL FABRICATING, INC.

817 HALL STREET ★ EATON RAPIDS, MICHIGAN ★ TELEPHONE 6781

DO *Outmoded* FOUNDRY OVENS BITE DEEP into Your PROFITS?

Modernize with LANLY SERVICES

Outdated - inefficient ovens can "drag" on your production and profit figures like a "ball and chain."

"Old Junkers" are "out of step" in the march forward by progressive foundries.

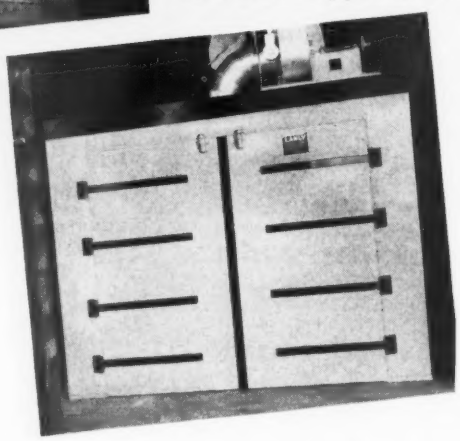
(Above) Drawer Type Oven.

(Left) Two Compartment Rack Type Oven.

THE oven requirements of the average foundry can be met with standard LANLY units.

Custom designed units for core baking, pasting and mold drying are part of LANLY'S services, as well as ovens for casting conditioning and heat-treating.

Write for the Catalog.



Rack Type Core Oven

THE LANLY CO.

OVENS FOR INDUSTRY

HEATED BY GAS, OIL, ELECTRICITY OR STEAM

780 PROSPECT AVENUE CLEVELAND, OHIO

Readers' COMMENT

Inoculating Agent Dropped

TO THE EDITORS:

On page 138 of April, 1951 issue of FOUNDRY the answer to the first question in the "Question and Answer" section reads as follows:

"SMZ, or silicon-manganese-zirconium, is a proprietary product available in two types. One contains 72 to 78 per cent Si, 6 to 8 per cent Mn, 6 to 8 per cent Zr and 5 per cent Fe while the other shows 60 to 65 per cent Si, 5 to 7 per cent Mn, 5 to 7 per cent Zr and 20 per cent Fe."

Some years ago we stopped production on the high-silicon grade "SMZ" that is mentioned and from that time have sold only the one grade of "SMZ," analyzing 60-65 per cent silicon, 5-7 per cent manganese, 5-7 per cent zirconium and approximately 20 per cent iron. Some years ago we put out a "SMZ" booklet which described two grades of "SMZ" alloy and it occurred to us that you might possibly have this particular pamphlet in your library and that this was used for the source of your information. If this is the case, would you kindly destroy the old literature and replace it with the one enclosed. The enclosed booklet, *"SMZ" Alloy and Its Uses,* describes this product and the composition is given on page 3.

Your April issue of FOUNDRY is a very handsome job and I particularly admire your front cover color photograph. I also enjoyed the excellent article on gating by Johnson, Bishop and Pellini.

H. C. AUFDERHAAR

Electro Metallurgical Division
Union Carbide & Carbon Corp.
230 N. Michigan Ave., Chicago 1

* * *

Prefers City Water Meter

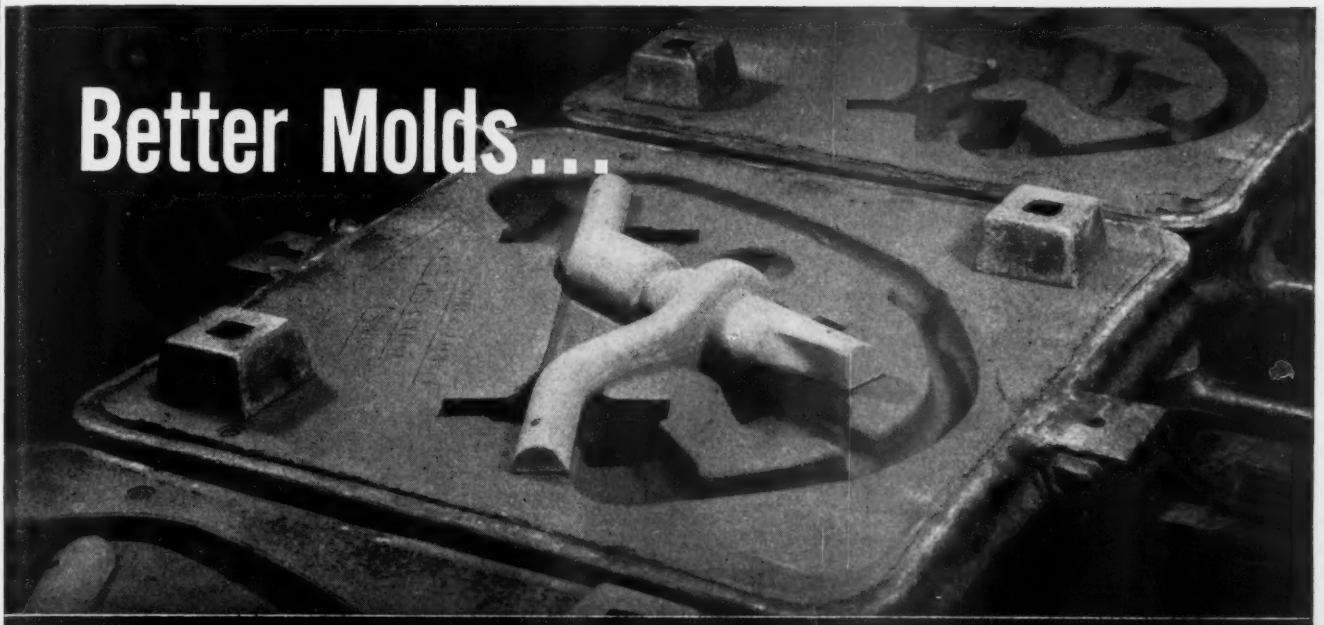
TO THE EDITORS:

"How to fix your sand mixer water gage and meter cheaply."

On several occasions we have received valuable tips from your magazine for which we thank you. We also offer this tip which we believe a good one.

We have found it very costly and difficult to keep in good working condition the ordinary type water meter and dial gage which is standard equip-

(*Continued on page* 94)



WITH *HERCULES*® **NVX** IN YOUR GREEN SAND FACING

The smoother your mold surfaces, the cleaner your castings—and the less time and money you spend in finishing. These unretouched photographs show typical results being obtained by one large foundry through the addition of one-quarter to one-half of one per cent by weight of "Hercules" NVX to its green sand facing.

Prove for yourself how NVX can improve sand flowability and workability . . . give *you* better molds and better castings . . . with a production-scale test. 100-lb. lots for testing are available from Hercules at the 1000-lb. price.

HERCULES POWDER COMPANY

Naval Stores Department, 920 King Street, Wilmington, Delaware

NF51-3

1901-1951

50th Anniversary

Today, more than ever, you can look to

TOLEDO

to guard your costs better!

After you've fought the battle of high costs, "criticals" and shortages—don't waste materials through careless handling! Tighten your control at every step! See that you have up-to-date scales —and enough scales—throughout your foundry. Look into the advantages of Printweigh in stopping losses that originate through human errors. Whatever your problems in receiving, charging, counting or other weighing operations . . . there's a modern Toledo to do the job with utmost *accuracy, speed* and *dependability.*

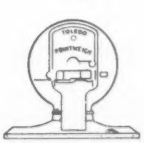
Today in your community you'll find Toledo as near as your phone; Toledo sales and service offices in more than 200 cities ready to help you in the selection or maintenance of scales vital in guarding your materials and costs.

Write for a copy of our 50th Anniversary Brochure . . . helpful information on modern Toledo equipment.

COUNTING SCALES

PORTABLE SCALES

FLOOR SCALES


PRINTWEIGHS

TOLEDO SCALE COMPANY

TOLEDO, OHIO . . . Toledo Scale Company of Canada, Ltd., Windsor, Ontario

HEADQUARTERS FOR SCALES

(*Continued from page* 92)

ment on sand mullers. Therefore, every time we told the mixer operator he was running the sand too wet he had the alibi that the meter was on the "fritz."

This got so critical that my partner (who is also the city mayor) borrowed a common house water meter from the city and replaced the glass face and dials with a larger steam gage, needle and all. This was done simply by extending the shaft. Then we connected it up to the mixer water supply.

We find this is a big improvement.

THEODORE E. MALPASS
Partner

East Jordan Iron Works
East Jordan, Mich.

* * *

Statuary Bronze Needs Number

TO THE EDITORS:

In April issue of FOUNDRY, Questions and Answers, appears the item "Generic Rather Than Specific."

This question has been asked many times in your magazine since I have been a subscriber, which is since 1921. I never have seen what I call the correct answer for statuary or ornamental bronze casting composition.

I have made castings for statuary, ornamental, memorial plaques, signs, cemetery castings, church castings, architectural castings, all in French sand, from 1918 to Jan. 1, 1950, as president of the American Marine Brass Foundry, 22 Berriman St., Brooklyn 8, N. Y. The name implies marine castings, but the only time we made marine castings was during both wars.

The bronze mixture we used all these years, with satisfactory results, is copper 88, tin 3, lead 1, zinc 8.

This mixture matches the color of the red metal furnished by the brass mills. It is malleable so that it can be bent to small radius, can be hand chased without cracking, peeling or scaling, can be oxidized with acid to give the statuary bronze color, and will turn green with age.

You will find many of the older builders such as New York Telephone Building, and Chanin Building, New York, used this mixture.

Someone should give this mixture a number for identification. The same should be done for the mixture used to match the extruded shapes furnished by the brass mills. The mixture I have used for many years to

(*Concluded on page* 96)

I've re-ordered B&W ALLMUL FIREBRICK

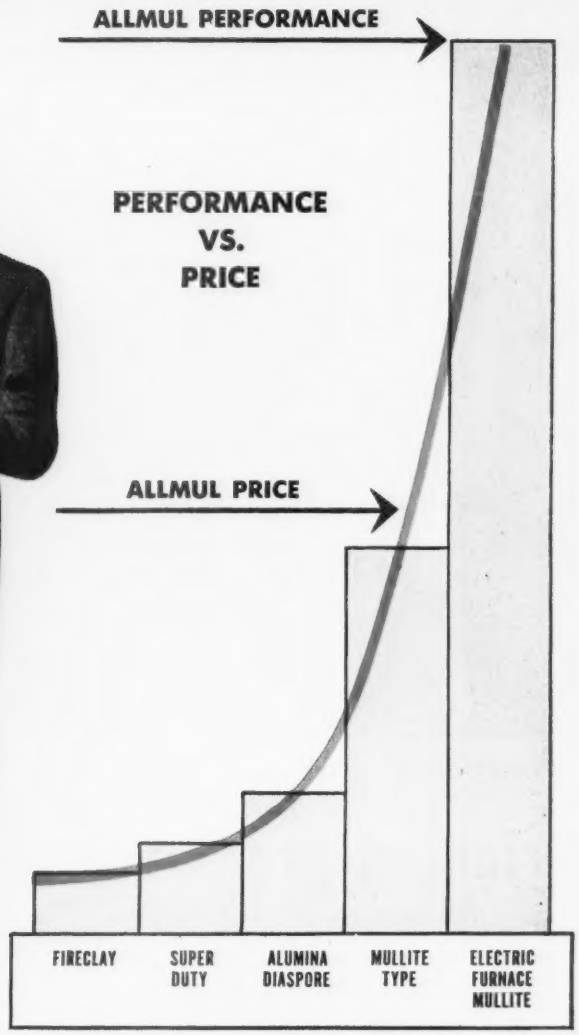
That's what scores of users are saying about B&W Allmul . . . the new, remarkable, electric-fused mullite firebrick. In plant after plant, Allmul has been *re-ordered* for such severe service applications as ferrous and non-ferrous melting furnaces, slag melting furnaces, butt-weld furnaces, glass tanks, checker chambers, ceramic kilns and many others. *That's proof of performance.*

There are two good reasons for the welcome Allmul has received. The first is its *price.* Mass-produced by a special, highly efficient process, top-quality Allmul comes to you at a price far lower than you would expect. For concrete evidence, look at the performance-price ratio charted at right.

The second reason is *staying power.* The panel below gives facts and figures . . . shows why no other firebrick in Allmul's price range can match its performance. In fact, no mullite brick at any price can better the performance of Allmul.

If you are not yet saving money with B&W Allmul, may we suggest you investigate this important new firebrick immediately. The sooner you start using Allmul, the greater your ultimate savings will be. SEND FOR NEW BULLETIN R-29.

ALLMUL is another important refractories development by B&W engineers who have continuously established new standards in industrial furnace refractories for the past 30 years.



CHECK THE PROPERTIES OF ALLMUL!

Here's how B&W Allmul stood up under standard tests.

SPALLING—12 cycles of heating to 2550F and chilling in cold air and water spray. **Result—no loss.**

HOT LOAD DEFORMATION—1½ hours at 3050F under load of 3600 pounds per square foot. **Result—less than 2% deformation.**

PERMANENT VOLUME CHANGE UNDER REHEATING—After 5 hours at 3200F. **Result—less than ½% change.**

FACT—no other firebrick in Allmul's price range can match its performance. **Fact**—no mullite brick at **any** price can better the performance of B&W Allmul.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 85 LIBERTY ST., NEW YORK 6, N.Y.
WORKS: AUGUSTA, GA.

R-395

B&W REFRACTORIES PRODUCTS — B&W 80 Firebrick • B&W Junior Firebrick • B&W 80 Glass Tank Blocks • B&W Insulating Firebrick B&W Refractory Castables, Plastics and Mortars • OTHER B&W PRODUCTS—Stationary & Marine Boilers and Component Equipment... Chemical Recovery Units . . . Seamless & Welded Tubes . . . Pulverizers . . . Fuel Burning Equipment . . . Pressure Vessels . . . Alloy Castings

(*Concluded from page* 94)

match the color is: Copper 81, tin 3.5, lead 2, zinc 13.5, lead limits 1.5 to 2.5.

GEORGE STAUB

24-07—146th St.
Whitestone, N. Y.

* * *

Who Makes Shaler Shaker?

TO THE EDITORS:

We have a unit known as the Shaler Shaker and have for some time been trying to locate the manufacturer of this equipment. To date we have not been able to locate any company or representative which handles this so-called shaker unit. Perhaps you may have some data which would be of assistance to us.

J. J. NAGY
Supt. of Maintenance
Great Lakes Mfg. & Foundry Co.
Fourth and Mulberry Sts.
Wyandotte, Mich.

Editor's Note: Does any reader have the answer?

* * *

Request for Address

TO THE EDITORS:

In the article "Casting Tools for Molding Nonmetallic Materials" in the March issue of FOUNDRY the name of W. G. Harvey, Stainless Cavity Corp., is mentioned. If possible we would like to have the address of this concern.

T. F. KRUMM

Editor's Note: The address is P.O. Box 178, Leominster, Mass.

* * *

Orchids for the Artists

TO THE EDITORS:

Many of us in the General Electric Chemical Dept. read FOUNDRY in connection with our interest in foundry phenolic resin applications. We have been impressed by the effects achieved with the combination of appropriate sketches and photographs and by the subtle contrasts in colors.

Although the copy in an article may be excellent, the reader will often skip over it unless it happens to be in his specific line of interest. These attractive layouts have caused me to read several articles which I might otherwise have missed and which I thoroughly enjoyed.

JAMES F. SOMERS
Chemicals Division
General Electric Co.
Detroit, Mich.

• • •

TO THE EDITORS:

We wish to take this opportunity to congratulate you on your new four-color April cover.

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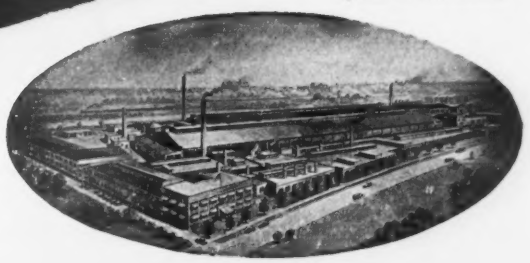

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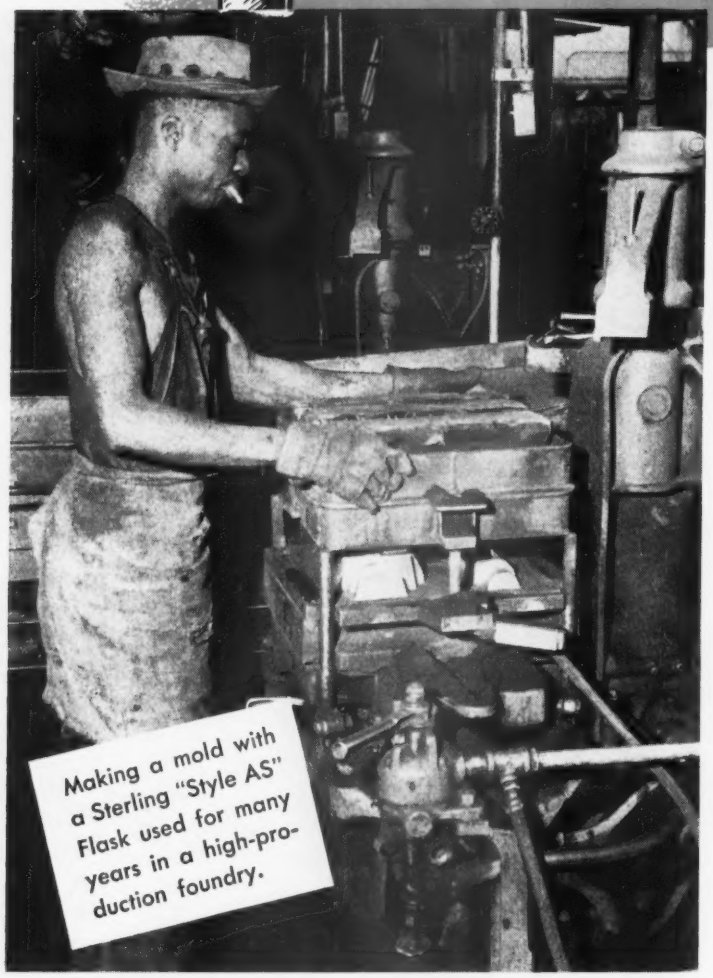

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Why Delay Longer?

REALIZING the importance of industrial know-how in war production, and wishing to assure participation by small business, Congress included mandatory provisions for consultation with industry advisory committees in the Defense Act of 1950. This requirement was spelled out carefully in rules of the National Production Authority applicable to meeting with groups of industry advisory representatives dated Dec. 18, 1950, as follows:

"Except when such consultation is found by the administrator to be impractical, no new rule, regulation, limitation or conservation order or amendment of an existing order, which will result in a substantial change in the rate of operations of an industry, shall be submitted for clearance without prior consultation with the proper industry advisory committee or committees of the industries to be affected. Every attempt should be made to consult the industry advisory committee as early as possible in the development of an order as is practicable."

This portion of the act is not being complied with by the NPA in connection with a number of important divisions of the foundry and related industries. Requests for industry committees were presented to NPA last August, names of possible members were submitted by the various trade associations in September and additional information has been supplied in the intervening period, but to date only the Aluminum Castings Committee and the Foundry Equipment and Supplies Committee have been announced. This leaves brass and bronze, gray iron, malleable iron and steel foundries without the proper organizations to consult with NPA.

The foundry industry insists that the time has come for NPA to take prompt action in appointing and activating advisory committees for these industrial divisions.

Foundry representatives are not included on the pig iron committee, although the pig iron section may make life-or-death decisions for many ferrous foundries. While our Washington sources report the chief of the Iron and Steel Castings Section championed the foundry industry well at a recent meeting of the pig iron advisory committee, the industry believes that this assistance should be augmented by foundry representatives on that committee.

The Department of Justice has ruled that advisory committees cannot be appointed unless the need is shown. There can be no doubt about the need for foundry industry advisory committees. Rules, regulations, limitation and conservation orders have been issued or are being considered which may have a pronounced effect on a sizable section of the foundry industry.

Surely over 5000 foundries, most of them in the category of small business establishments, should be represented in the formulation of the orders that will have so much influence on the future of this basic industry.

Frank G. Steinbach
Editor

WALTER L. SEELBACH
President-elect

I. RICHARDS WAGNER
Vice President-elect

JUDGED by attendance and interest shown in the various sessions of the American Foundrymen's Society convention at Hotel Statler, Buffalo, Apr. 23-26, this 55th annual meeting ranks with the most successful of the national gatherings. Comment by many of the approximately 3000 registrants attested to the high quality of the technical program arranged by the different metals and general interest divisions and committees under the direction of S. C. Massari, AFS technical director.

Influence of the national defense program was evidenced both directly and indirectly at many of the convention sessions. Foundrymen are concerned over scarcity and lowered quality of certain raw materials. They also are seeking more efficient methods of producing the growing portion of their output which is being diverted to defense needs.

Tremendous interest in the problems created by material controls of Washington defense agencies was well illustrated at two overflow luncheons which drew a total attendance of approximately 600.

A Tuesday luncheon session, sponsored jointly by the Foundry Equipment Manufacturers' Association and the Foundry Facing Manufacturers' Association, featured a question-and-answer period of special interest to equipment and supply manufacturers but also drawing participation of foundrymen. C. V. Nass, Beardsley & Piper Division, Pettibone Mulliken

Defense Needs Influence

AFS Convention Sessions

Fig. 1—Featured technical attraction was the day-long symposium on "Principles of Gating." Shown here is part of the audience of nearly a thousand

Fig. 2—AFS President Walton L. Woody delivers his address at the 55th annual business meeting

Fig. 3—Opening day found the AFS registration desk at Buffalo's Hotel Statler a crowded place

Corp., Chicago, and president of the FEMA, and F. B. Flynn, S. Obermayer & Co., Chicago, and president of the Foundry Facing Manufacturers' Association, presided. Aubrey J. Grindle, director, Foundry Equipment and Supplies Section, General Industrial Equipment Division, National Production Authority, and Thomas Kaveny Jr., Herman Pneumatic Machine Co., Pittsburgh, and industry consultant to the Foundry Equipment and Supplies Section, endeavored to answer questions relating chiefly to procedures for procuring materials needed to produce foundry equipment and supplies.

Mr. Grindle handled questions concerning the new setup of the NPA and the functioning of the Foundry Equipment and Supplies Section. He indicated a general reorganization of NPA which would change the names of divisions but which would not affect the functioning of the section. Mr. Kaveny outlined the recently announced Controlled Materials Plan and pointed to the help this method of allocating steel, copper and aluminum would provide equipment and supply manufacturers producing defense and defense supporting products.

Both speakers as well as the chairmen emphasized the importance of foundrymen supplying equipment and supply manufacturers with ratings on orders placed. The basic character of castings would indicate such ratings can be secured if the case is presented to the proper department at Washington, properly documented with data on the manufacturer with which the order has been placed, the need for the equipment, etc. It was pointed out that unless such ratings are obtained, the industry will not be able to secure its proper share of materials of construction in comparison with other industries.

A defense production luncheon meeting was held Wednesday, with Walter L. Seelbach, Superior Foundry Inc., Cleveland and president-elect of the society, presiding. Four representatives of Washington defense agencies endeavored through prepared remarks and answers to questions to alleviate some of the confusion surrounding production under the various government controls.

Nigel H. Bell, director, Aluminum and Magnesium Division, NPA, commented upon the sea of criticism which followed the issuance of order M-22 and indicated that revision shortly will be presented for consideration of several advisory groups. Changes contemplated would permit a foundry to melt cast scrap and certain quantities of 2S and 3S clippings required for upgrading. In addition, any foundry demonstrating ability to handle other grades of scrap—including the possession of proper equipment and chemical and metallurgical control over operations—would be given authority to use any type of scrap consistent with the quality of the product and the primary intent of order M-22, which is conservation for defense.

Inauguration of CMP probably will increase the availability of virgin metal, because the supply will be under more direct supervision, according to Mr. Bell. However, he pointed out it is essential every advantage be obtained from the use of secondary ingot. To accomplish this, close liaison between the Aluminum and Magnesium Division and the defense procuring agencies will be established, and the former will endeavor to encourage substitution of secondary ingot to reduce the heavy drain on primary metal. If full mobilization comes, demand for aluminum castings probably will be proportionately less than in World War II, but the average size of castings will be larger, according to Mr. Bell. Magnesium casting requirements under that situation will possibly double those of the previous war emergency, so that total demand for light metal castings will be approximately the same as in the last war.

John A. Claussen, chief, Pig Iron Section, Iron and Steel Division, NPA, discussed the problems of the integrated and merchant pig iron producers and reported on the blast furnace expansion program now under way. This expansion is mostly in connection with integrated steel companies. In 1949, of the total shipments of merchant pig iron, the integrated producers supplied 41.4 per cent and the merchant producers 58.6 per cent. In 1950 the ratio was integrated 40.6 per cent and the merchant 59.4 per cent. For the first two months in 1951 it was 41.6 per cent and 58.4 per cent, respectively. In 1949 shipments of merchant pig iron to foundries and steel companies who do not produce iron were 5,815,510 tons. In 1950 the total

Fig. 4—A few of the approximately 3000 foundrymen who attended the convention. This was AFS registration headquarters Monday morning

was 7,476,021 net tons, an increase of 1,660,511 net tons, or over 28 per cent. In addition, 1950 imports of pig iron were the highest in history, exceeding 700,000 gross tons, or about 245,000 tons higher than the previous record of 446,000 tons in 1926. Mr. Claussen said the foundry industry received approximately 30 per cent more pig iron in 1950 than in 1948.

That producers of pig iron have done an excellent job in distributing merchant supplies was stressed by Mr. Claussen. While some people feel that allocation would be a cure-all for all of their troubles, allocation does not add one ton to available supplies and might even result in a reduction of supplies to some users. He pointed out that two steps have been taken to assure more equitable distribution and to provide for essential requirements. These are:

1—Inventory control. Order M-1 specifies that inventory must not exceed a practical working minimum or 30 days whichever is less. A check on inventories will be available from reports filed by foundries on Form M 21-C.

2—DO ratings. These ratings have been issued under Regulation 2 of NPA to cover various programs considered essential. These ratings are extendable to secure the pig iron necessary. A manufacturer of castings, either for own use or for sale who receives a DO rating on his castings can extend the same to get pig iron. DO ratings for pig iron should be only for a tonnage sufficient to make the tonnage of castings required by the DO rating. They should specify deliveries of pig iron only in accordance with the delivery of the end product. They should be extended to the normal source of supply.

Mr. Claussen also stated that while foreign pig iron is continuing to arrive, indications point to a reduction, due to increased needs in the producing countries and increased competition for available supplies from other countries.

A. J. McDonald, chief, Castings Section, Iron and Steel Division, NPA, stated that as a forerunner to the Controlled Materials Plan, his department is attempting to estimate the quantities of various materials foundries will use in production and in extending MRO. At the same time, the General Industrial Equipment Division it attempting to forecast items of foundry equipment that will be needed the next 12 months. NPA must have accurate information covering these requirements if the industry is to secure needed materials.

Fig. 5—James C. Zeder, Chrysler Corp., Detroit, delivering the Charles Edgar Hoyt Annual Lecture

Need Co-operation of Industry

In response to a question regarding scrap, Mr. McDonald indicated that NPA is well aware that unbalanced inventories and shortages at individual plants continue. Due to increased facilities and record production, industry is losing scrap inventory at the rate of 250,000 tons per month, making it highly important that every user of scrap give serious consideration to relaxing specifications wherever possible to permit the use of scrap grades not usually utilized. It also was suggested that application to the Scrap Section of NPA for help be only a last resort and then with complete information as to inventories on hand and consumption, keeping in mind that DO-rated orders have no bearing on the allocation of scrap. NPA has plans to keep high-grade scrap iron and steel moving into steel mills and foundries to meet production goals for 1951 and 1952. Mr. McDonald stressed the importance of industry participating in this program.

Considerable time was devoted to answering questions regarding the Melting Schedule NPA form 60 through which the Metallurgical and Conservation Branch of the Iron and Steel Division is endeavoring to conserve scarce alloying elements. It was pointed out that if properly executed and prepared by industry, the melt schedule should be of considerable benefit to foundrymen as it will enable them, with the authority of the government, to obtain data about the end use of the castings. This in turn will enable foundrymen better to serve the customer and will provide a means for obtaining scarce alloys. It was also pointed out that using the melt schedule, the Metallurgical and Conservation Branch may down-grade the products as to alloy content and may delete items that, in comparison with the whole, are considered non-essential.

A question permitted Mr. McDonald to stress the importance of maintaining quality standards in the emergency period, where there is an abundance of business and perhaps a temptation to consider almost anything good enough for the customer. He pointed out that during recent years the foundry industry has made great progress in bolstering confidence in cast parts to specific applications. Product engineering as applied by the foundry to customer and foundry problems on individual jobs is making a major contribution to the present high levels of iron and steel production. This is evident by what one segment of the foundry industry did in one year by converting to cast parts almost 8000 tons with an approximate sales value of almost $3.5 million. However, the industry may face the danger of sacrificing these gains by complacency with a sudden return to a high operating level. This should be resisted to the utmost.

Lt. Comdr. William A. Meissner Jr., Bureau of Ships, Washington, and liaison officer to NPA, pointed out that the Material Control Division of the Bureau of Ships must adhere to all NPA orders and regulations and also must convince the Munitions Board and the NPA that its requirements are justified. Problems within the brass and bronze foundry industries at the moment are very complex, and difficulties are being encountered in obtaining alloy ingot, scrap and copper. The problem of finding adequate scrap supplies and controlling its distribution is receiving considerable study by the NPA Copper Division. While at present there is no exact way of knowing the amount of brass, bronze and copper castings being produced for the Bureau of Ships, it is believed that approximately 11 per cent of the current total is for that purpose.

In response to a question as to why no advisory committee for the nonferrous industry has been appointed, Commander Meissner said that work in that direction is now under way. Telegrams were sent to individuals Apr. 14, 1951. It is probable that action was not taken sooner because the NPA Copper Division has not selected a head for the foundry branch. Actually, an unofficial advisory committee has been functioning, consisting of J. D. Zaiser, Ampco Metal Inc., Milwaukee; Walter M. Clark, D. W. Clark & Co., South Boston; Fred Haack Jr., Capital Brass & Aluminum Foundry Co., Chicago; William A. Gluntz, Gluntz Brass & Aluminum Foundry Co., Cleveland and J. W. Wolfe, secretary-treasurer, Non-Ferrous Founders' Society, Chicago.

At the annual business meeting of the society, AFS President Walton L. Woody, National Malleable & Steel Castings Co., Cleveland, paid tribute to the many members who have helped to promote the society's activities through work on national committees and with the chapters.

William W. Maloney, AFS secretary-treasurer, cast a unanimous ballot for officers and directors selected several months ago by the nominating committee. Next president of the society, to take office at the annual board meeting after the close of the fiscal year June 30, will be Walter L. Seelbach, president, Superior Foundry Inc., Cleveland, and currently AFS vice president. Succeeding him in the latter capacity will be I. Richards Wagner, director and former president, Electric Steel Castings Co., Indianapolis.

Elected directors for three-year terms were: Martin J. O'Brien Jr., works manager, Symington-Gould Corp., Depew, N. Y.; Harry W. Dietert, president, Harry W. Dietert Co., Detroit; Albert L. Hunt, works manager, National Bearing Division of American Brake Shoe Co., St. Louis; Dr. James T. MacKenzie, technical director, American Cast Iron Pipe Co., Birmingham; A. M. Ondreyco, plant manager, Vulcan Foundry Co., Oakland, Calif. Upon his retirement as president, Mr. Woody will serve one year as a director.

Prof. George J. Barker, University of Wisconsin, discussed briefly the importance of the work being done by the AFS Educational Division, of which he is chairman.

Mr. Maloney also announced the names of winners in the 28th annual AFS apprentice contests. First, second and third places, respectively, in the five divisions were won by: *Gray Iron Molding*—Harold M. Carty, Caterpillar Tractor Co., Peoria, Ill.; Gerald Schrank, Nordberg Mfg. Co., Milwaukee; Donald N. Marinelli, Fulton Foundry & Machine Co., Cleveland. *Steel Molding*—J. G. Polino, Dominion Engineering Works Ltd., Montreal; Adolph C. Zinn, Waukesha Foundry Co., Waukesha, Wis.; Norman G. Bublitz, Bucyrus-Erie Co., Milwaukee.

Nonferrous Molding—Hilary J. Heck, Nordberg Mfg. Co., Milwaukee; Gilbert Dandoy, Montreal Bronze Ltd., Quebec; T. G. Wilcox, Dominion Engineering Works, Montreal. *Wood Patternmaking*—Charles J. Hofschroer, Kay-Brunner Steel Products Inc., Alhambra, Calif.; Gene Bush, Worthington Pump & Machinery Corp., Buffalo; Allen R. Klein, Olney Foundry, Link-Belt Co., Philadelphia. *Metal Patternmaking*—Marvin J. Lohnes, Caterpillar Tractor Co., Peoria, Ill.; Joseph E. Collins Jr., Packard Motor Car Co., Detroit; John W. Burkholder Jr., Central Pattern Co., St. Louis.

First-prize winners were present at the meeting as guests of the society to receive their $100 awards from President Woody.

Greetings to the society from European foundrymen were extended at the meeting—in the form of a cable from the Institute of British Foundrymen, and a personal message from the French by Robert Ronceray, head of one of France's leading foundries, who attended the convention.

At the conclusion of the business meeting Mr. Woody introduced James C. Zeder, director of engineering and research, Detroit, who delivered the Charles Edgar Hoyt Annual Lecture. Mr. Zeder's address, entitled "The Management of Industrial Research," was an interesting and comprehensive analysis of the function and accomplishments of research in American industry and how research organizations should be set up to operate most effectively.

He pointed out that the advent of large-scale research is responsible to a large degree for the modern conveniences we have enjoyed in recent years. A stimulus to research is the attitude of American people in welcoming changes and their eagerness to adopt the fruits of research. Mr. Zeder said these four types of research are important: 1. Academic—the search for new facts without regard to their immediate application. 2. Engineering research. 3. Product engineering and development. 4. Production testing. It was emphasized that the man who heads the research department is the most important factor in its success. He must be both an organizer and an administrator, and be able to plan for the future while guiding current work. He must be practical, justifying the cost of his operations and learning not only what should be done but also what not to attempt.

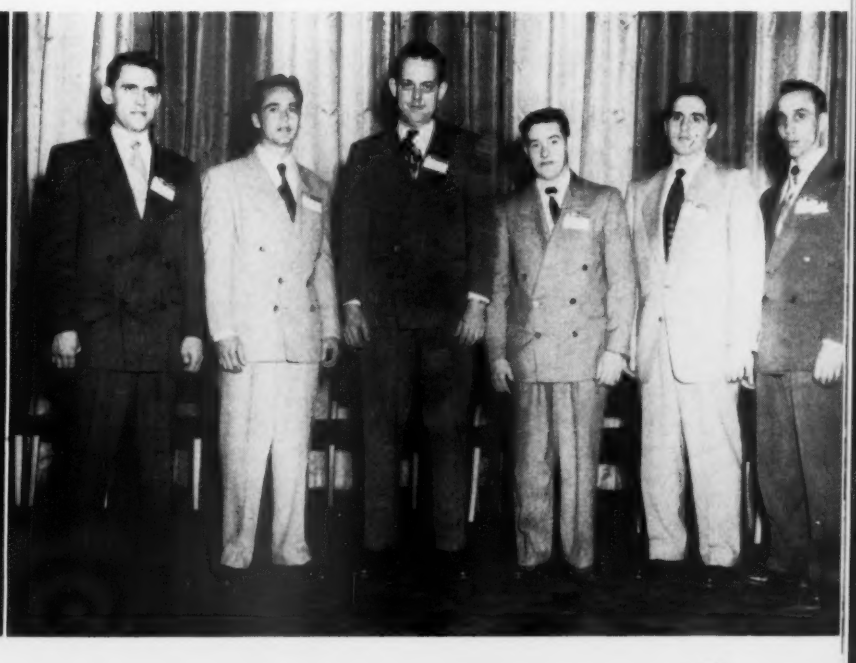
Research departments need the support of other industrial divisions which will use the results of research; therefore it is desirable to integrate the research group with the engineering department rather than isolate it. At the same time it should not be saddled with the solution of production problems.

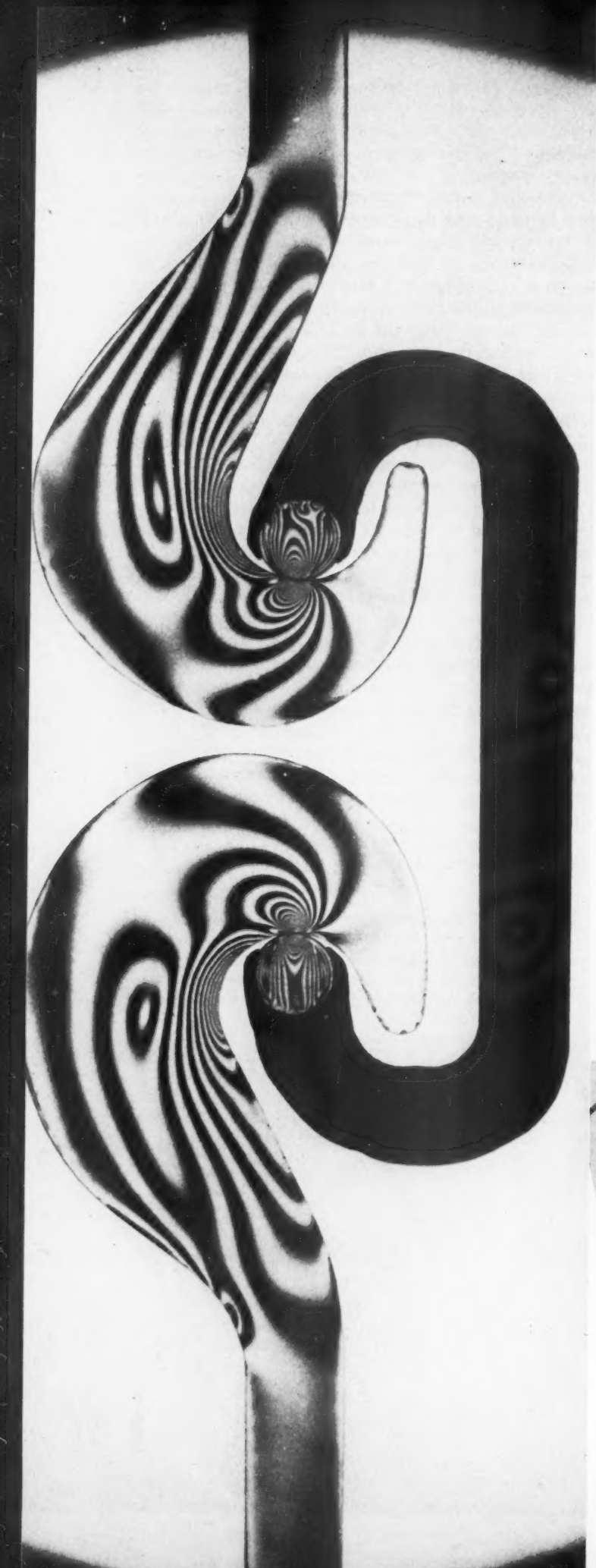
Research is expensive, Mr. Zeder emphasized, and it should not be over-bought. (*Please turn to page* 154)

Fig. 6—Convention visitors inspecting winning entries in the AFS annual apprentice contests. Prizes were offered in molding and patternmaking

Fig. 7—Several hundred "old timers" registered during the convention. Here, left to right, are: standing—Robert E. Kennedy, AFS secretary emeritus; Ben D. Fuller, Cleveland, past president; Charles Edgar Hoyt, retired executive vice president; seated—Dr. G. H. Clamer, Philadelphia, past president

Fig. 8—Apprentice contest winners at the convention. Left to right: J. G. Polino, Charles J. Hofschroer, Marvin J. Lohnes, Harold M. Carty, Hilary J. Heck and Gerald Schrank. Mr. Schrank was a second-place winner; the others placed first in their divisions





By JOHN B. CAINE
Technical Consultant
Cincinnati

What's Wrong W

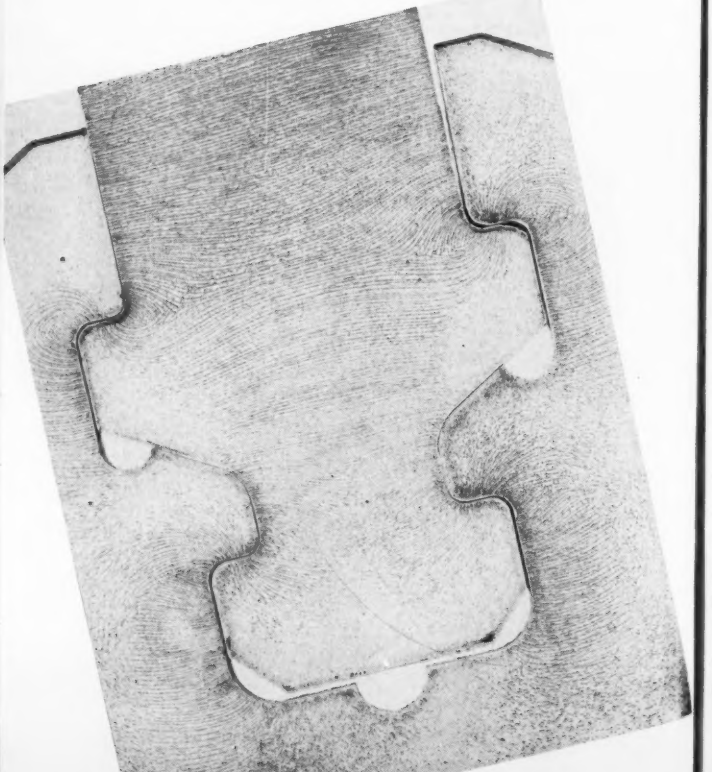
WHAT is wrong with castings? Nothing! Except that, in at least one respect, foundrymen must be real Christians—if following a teaching of the Bible is the requirement. What is it about turning the other cheek? The foundry industry has been meekly turning the other cheek, to be slapped again and again by advertising claims of its competitor, the wrought metals industry.

Admitted that it isn't cricket to advertise the other fellow's failings, admitted that it is Christian-like to turn the other cheek, there is a limit to everything. No matter how much you would like to follow the Queensberry rules when in the ring, if there is no referee present you must fight the other fellow's fight.

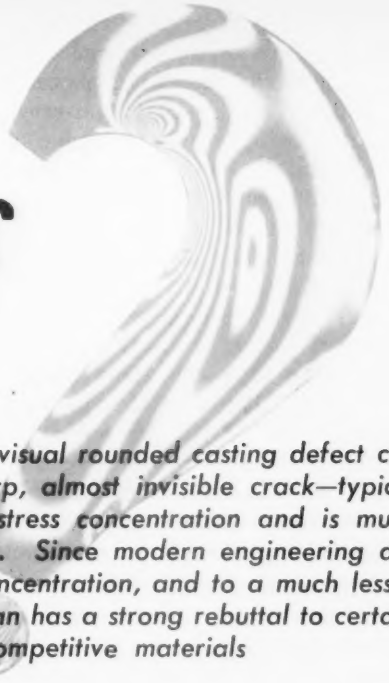
And don't think there isn't plenty to fight with! The wrought metals people have been rubbing the

Fig. 1 (left)—Plastic models of loaded hooks. The material causes light transmission to be changed in stressed areas. Frequency of the dark bands is indication of the extent of stress concentration

Fig. 2 (below)—Stress concentration also can be studied by coating part with extremely brittle lacquer. A slight load will crack the lacquer, most cracks developing at highly stressed areas



With Castings



Many foundrymen do not realize that a visual rounded casting defect can be relatively innocuous, whereas a sharp, almost invisible crack—typical of defects in wrought metal—increases stress concentration and is much more dangerous in service than porosity. Since modern engineering design is concerned primarily with stress concentration, and to a much lesser extent with the metal itself, the foundryman has a strong rebuttal to certain claims for superiority of competitive materials

foundries' noses in "porosity" for years. They do not distinguish between gas porosity or dispersed shrinkage. To read their advertisements they never have any defects; castings have them all. They do though, but they don't call them by the same names we do. Shrinkage porosity is "pipe" in wrought metals. Gas porosity (when not welded during hot work) as well as other defects inherent to forging and rolling are known as "seams" and "laps." Most every casting defect has its wrought counterpart, for all wrought metals were originally cast metals in the ingot.

There are only two significant differences between cast and wrought defects—size and shape. Defects in cast metals are usually of such size and shape as to be visible to the unaided eye—too visible as all foundrymen know too well. The same defects have been mashed flat during forging and rolling and are then difficult to detect by visual examination.

The normal conclusion that the larger the defect the worse it is, is a grossly erroneous generality under these circumstances. Usually just the opposite is true, for in modern engineering design stress concentration is of primary importance. A large rounded defect (a typical casting defect) can be relatively innocuous, whereas a sharp almost invisible crack is the worst possible defect. Perhaps the foundry industry has fallen into the same erroneous thinking of the casual observer and a detailed discussion is in order.

A discussion of defects can very easily degenerate into a name-calling match, but all efforts should be made to avoid this. Modern design and serviceability tend to de-emphasize the older, so-called physical properties, especially those in axial tension as determined in the standard tension test. Modern design is based on stress concentration—stress concentration as the major component of fatigue resistance, stress concentration as the major component of resistance to brittle failure of a part while it is in service.

At the same time the designer is becoming aware that his design and the actual fabrication of the part are the major factors determining the relative degree of stress concentration and serviceability of the part. The metal itself is a minor component. The modern designer is interested in only two metal factors: Are there any defects in the metal that will increase the stress concentration above that allowed by the design; secondarily, and very secondarily, in average service is the metal itself resistant to brittle fracture under stress concentration? With normal factors of safety the classic tensile properties are assured if the metal meets only hardness specifications.

Resistance to brittle fracture is of secondary importance, for unless the part is highly stressed, contains unavoidably high stress raisers, and is subject to low temperatures in service this property is meaningless. Only a minor fraction of service conditions meet these three requirements. Then, too, there are ways and means of making the metal resistant to this type of service failure. Sometimes they are expensive, but if resistance to brittle fracture is required and the cheapest way to obtain it is by making the metal resistant, it can be done. For steel it simply means a quench and tempering heat treatment rather than an anneal, or normalize, plus possibly some alloy if the section is large.

However, there is no known method of making metal more resistant to fatigue failure. Fatigue strength—resistance to fatigue failure—is 100 per cent stress concentration. The way to increase the fatigue strength of a part is not by increasing the fatigue strength of the metal, but by eliminating stress concentration, either in the design or, as far as the metal is concerned, by insuring that no deleterious defects are present. This cannot be accomplished with test bars; it must be done by studying the part

to be used. An important part of this study is to determine if any defects are of such shape and in such a position as to increase the stress concentration to values that will make the part fail in service.

The implications of this approach to design and inspection are far reaching and basically different from those accepted in the past. The classic physical properties of the metal are of minor importance; defects, and just how the part is fabricated, heat treated and loaded in service are all-important. If a dumb foundryman—such as the writer—says this, the reader is justified in raising a sceptical eyebrow. If the designer and user says the same thing, it should carry weight. Well, listen to this by Almen of General Motors, who should fill the bill: "Fully 90 per cent of all fatigue failures occurring during laboratory and road tests are traceable to design and production defects and only the remaining 10 per cent are primarily the responsibility of the metallurgist as defects in material, material specification, or heat treatment."

Therefore a frank comparison of defects in cast and wrought shapes is in order and is not a name-calling match. But first let us see what is meant by stress concentration and how defects of various shapes, sizes and location affect this stress concentration. There are many ways to determine the degree of stress concentration, but the best for illustrative purposes is that of photoelastic studies. Photographs are taken of stressed plastic models. The material used for these models causes light transmission to be changed in the stressed areas, and the frequency of the dark bands present denotes the degree of stress concentration at any given point.

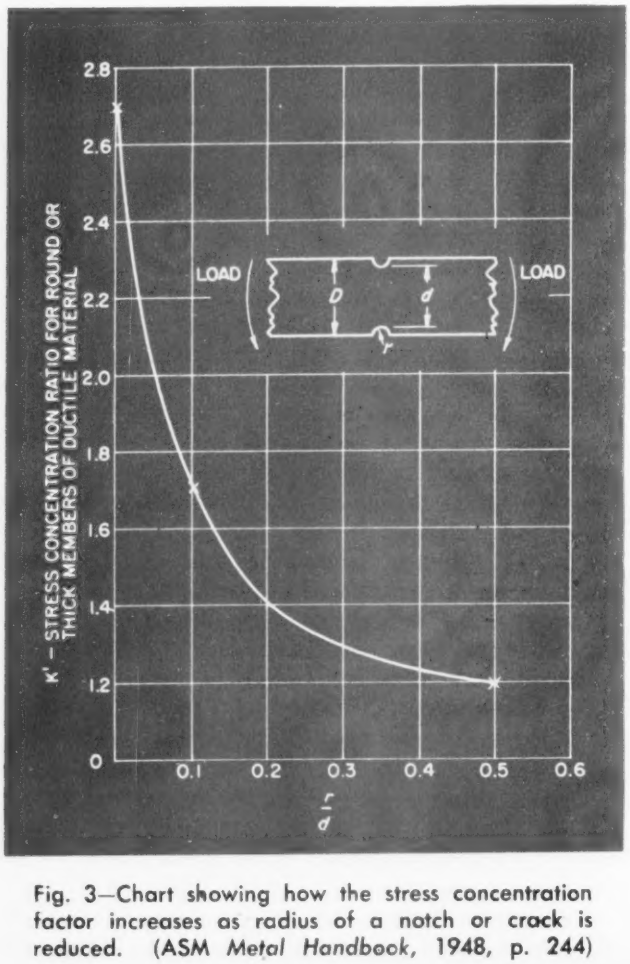


Fig. 3—Chart showing how the stress concentration factor increases as radius of a notch or crack is reduced. (ASM *Metal Handbook*, 1948, p. 244)

Fig. 1 illustrates a classic example, a loaded hook. Note the concentration of dark fringe bands at the point of load and at what is relatively an enormous radius at the base of the curve of the hook. Just imagine the increase in dark fringe bands and stress concentration if the bend in the hook were sharp, with a radius of only a fraction of a thousandth of an inch. This would be the condition if a crack-like defect were present in the bend of the hook.

Photoelastic studies, such as shown in Fig. 1, are quite complex and require too much special equipment for the average foundry. This is not true of brittle lacquer studies such as shown in Fig. 2. The part to be studied is covered with an extremely brittle lacquer that will crack under a minimum of strain. When the casting is loaded, the slightest deformation of any area—even in the elastic range—will crack the lacquer. Naturally, those areas under stress concentration will deform more than those under less strain. The greater the load, the greater the deformation and the more cracks in the brittle lacquer.

Note the similarity between the frequency of cracks in the brittle lacquer in Fig. 2 at the stressed corners of the part and the concentration of black interference bands in Fig. 1. Both denote high stress. Then imagine the effect of a sharp discontinuity that would decrease the radius of the corners in Fig. 2 many thousand times.

Cracks and Notches Comparable

It is interesting to compare the relative effect of a sharp crack that may be almost invisible, to a discrete rounded void such as a blow or sand defect. The mechanical engineer has made an extensive study of "stress raisers," as he calls them—fillets at junctions of sections, notches, holes through the section. There is at least a rough correlation between these stress raisers and defects. A sharp crack corresponds to a sharp notch, a more rounded defect to a notch or hole with a radius equal to the radius of the larger defect.

Fig. 3 illustrates such an example. A sharp, almost invisible crack corresponds to a notch with a radius (r in Fig. 3) of 0.001-in. at the base of the notch. Such a notch will increase the stress (K' in Fig. 3) by a factor of 2.70. In other words, if the nominal stress imposed on a small section, say a ½-in. section, was calculated at 10,000 psi, the actual stress of such a section containing a crack with a radius of 0.001-in. at the base of the crack would be in the order of 27,000 psi. This stress concentration factor increases as the section size increases.

A readily visible defect at the surface with a radius of ⅛-in. and the same depth as the crack-like defect will increase the stress concentration factor to only 1.35. This defect would increase the true load from 10,000 to only 13,500 psi. The defect that is visible—so visible that it would scrap most castings today—has actually loaded the (*Please turn to page* 267

By JOHN HOWE HALL
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Swarthmore, Pa.

Steelmaking FOR CASTINGS

Operation of the acid open-hearth furnace, including typical heats, is discussed in this fourth of a series of articles on steel melting practice in production of castings

ROUGHLY half of the open-hearth furnaces in American steel foundries are operated by the acid process, and make a little over half of the open-hearth steel poured into castings. With some exceptions, acid open-hearth steel is used mostly for heavy and medium weight castings, in which hot tearing is neither so likely to occur nor so serious as in large thin-section pieces like freight car side frames and bolsters.

Broadly, the principles of the process are exceedingly simple. A charge of steel scrap and pig iron, with or without extra carbonaceous material, is melted with a somewhat oxidizing flame. As the metal melts, most of the silicon and manganese and some of the iron of the pig and scrap are converted by the excess oxygen of the flame into silica (SiO_2), Manganese oxide (MnO) and iron oxide (FeO). The oxides of manganese and iron unite with the silica, and with silica absorbed from the bottom of the furnace, to form a fluid slag which floats on top of the melted steel. At the same time, carbon is oxidized to CO, and escapes with the products of combustion of the fuel. To insure proper "boiling" of the bath, the carbon of the charge is purposely made so high that oxidation during the melt-down will eliminate only part of it, and leave from 0.40 per cent to 0.90 per cent in the melted bath.

After the charge is all molten, iron oxide in the slag still further reduces the silicon and manganese content of the metal, and then attacks the carbon, forming CO and causing a vigorous boiling of the bath. Sometimes the rust on the scrap, added to the FeO formed in melting down, provides enough iron oxide to give a satisfactory boil, and at other times more must be provided in the form of iron ore or mill scale.

Iron oxide in the slag should be made high enough to give a rapid rate of carbon elimination during the first part of the boil. It is bad practice, however, to use so much ore that the carbon still is being rapidly oxidized when the heat is ready to tap. Instead, the rate of carbon drop should decrease after the boil has been maintained for the necessary length of time, and should be quite low at the end of the heat. In this way the iron oxide in the metal is largely reduced by carbon and eliminated as CO, leaving only minor amounts to react with silicon and manganese. Since the products of the reduction of iron oxide by silicon and manganese are SiO_2 and MnO_2, which remain in the steel as solid inclusions, it is desirable to give the carbon time to reduce as much of the iron oxide as possible.

As will be explained later, even when the reaction between the FeO of the slag and the carbon of the metal is allowed to proceed to such a point that the slag has largely lost its oxidizing power, the steel still holds considerable FeO in solution. At high temperature, this oxide is in equilibrium with the carbon of the metal, and does not react with it to form CO. As the metal cools, however, the solubility of FeO in the steel decreases rapidly, and its tendency to react with carbon grows progressively greater. Were the content of FeO not reduced below what it is at the end of the boil, therefore, large amounts of CO would be formed in the steel as it cools and solidifies in the molds, and the castings would be full of gas holes.

The silicon and manganese added at the end of the heat serve to reduce the FeO content of the steel to such a point that it will not react with the carbon, and sound castings will be obtained. Many acid open-hearth furnace operators find that they can produce steel that will not generate CO in this way, simply by the use of silicon and manganese, even though a certain amount of FeO remains in the metal.

In some cases, however, aluminum is used to reduce the FeO content below what it is when only silicon and manganese are employed. Aluminum has a greater affinity for oxygen and, therefore, will eliminate much more FeO than will either silicon or manganese. When an addition of aluminum is considered essential for the production of sound castings, it is added to acid open-hearth steel in amounts of from 0.2 to 1.2 lb per ton (0.01 to 0.06 per cent). The aluminum is tossed into the stream when the ladle is about one-fourth to one-third full.

Some operators prefer to reduce the carbon to only a few points below the amount desired in the finished steel, while others continue the oxidation until the carbon content is between 0.10 and 0.15 per cent. In either case, by the time the carbon reaches the desired point, the bath has attained the necessary temperature. The oxidation of carbon then is stopped or "blocked" by charging ferro-silicon, silico-spiegel or similar alloys. Since silicon has a greater affinity for oxygen than carbon has, at the temperatures then prevailing, it protects the carbon from further oxidation until all the silicon has reacted with oxygen. When this "blocking" addition has been melted, the required amount of manganese is added in the form of ferroalloys, and the taphole is opened as soon as this material has melted.

If the final additions are made when the carbon of the bath is only a little below the desired percentage, the ferroalloys (*Please turn to page* 232)

RAPID GROWTH MARKS Texas Malleable

By WILLIAM G. GUDE
Managing Editor
FOUNDRY

MEASURED by the average age of all malleable iron foundries, Texas Foundries Inc., Lufkin, Tex., might be termed a relative newcomer to that industry. But during its 12 years of operation it has expanded rapidly to establish itself among the leaders of its field. Since the company is located in a state where almost everything—from Texas' wide open spaces to its great production of mineral and agricultural commodities—is best described by the higher-bracket figures, the steady growth of the foundry could be considered as being in keeping with its environment.

Texas Foundries was organized in 1938 and poured its first metal in March, 1939. The plant originally was designed for a yearly capacity of 3000 tons of malleable iron castings. In recent years its annual output has exceeded 10,000 tons and its total employment has risen to about 500. Recently the company started an expansion program which will enable it to produce 14,000 to 15,000 tons a year. Because Texas Foundries is the only malleable iron foundry in the Lone Star state it has had an opportunity to grow with the industrial expansion of the Southwest, but no small measure of its success is attributable to its development of new applications for malleable iron castings in the industries it serves.

Guiding spirits in the establishment and growth of the company have been Cal C. Chambers and R. S. Bradshaw, Jr. Before going to Texas, Mr. Chambers was vice president and general manager of the Southern Malleable Iron Co., East St. Louis, Ill. and vice president and treasurer of the Wrought Iron Range Co., St. Louis. Mr. Bradshaw was vice president and assistant general manager of Southern Malleable Iron Co. When Southern Malleable discontinued opera-

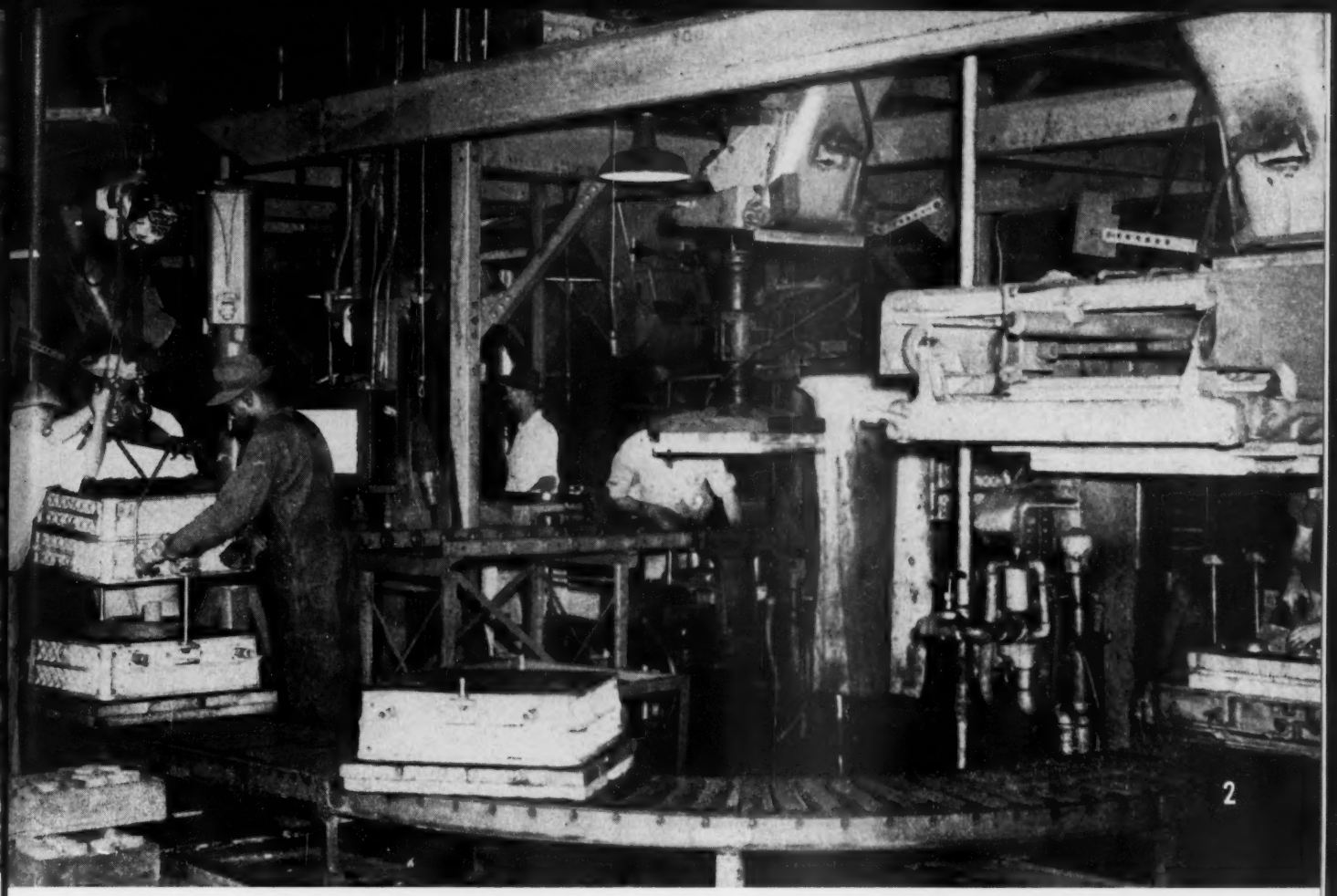


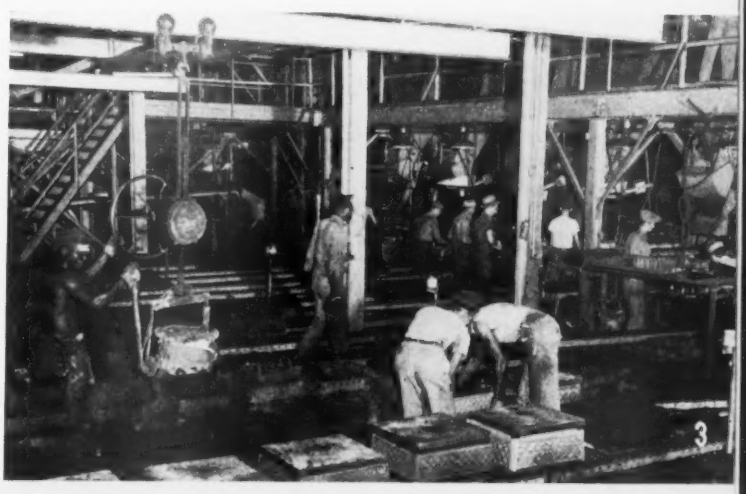
Fig. 1—Some of the mold pouring lines at the malleable iron foundry of Texas Foundries Inc., Lufkin, Tex. Fig. 2—High-speed cope and drag unit handles larger castings. Fig. 3—Stairway at left leads to balcony where sand preparation and distribution facilities are located

Foundry

tions in 1938 Mr. Chambers and Mr. Bradshaw joined the newly organized Texas Foundries in Lufkin, of which the late W. C. Trout, president of Lufkin Foundry & Machine Co., was president. In 1939 Mr. Trout became chairman of the board of directors of Texas Foundries Inc.; Mr. Chambers was made president and general manager and Mr. Bradshaw was made vice president and production manager.

A wide variety of size and type of malleable iron castings are produced by the company from its approximately 6700 active patterns. Average weight of casting made is 3½ to 4 pounds and the largest sizes produced have ranged up to 475 pounds. Castings supplied the petroleum industry—for oil field equipment, pipe fittings, valves, etc.—account for about one-fourth of the output. Cast parts for farm implements and automotive accessories represent nearly one-third of the total tonnage. The remainder goes to railroads, electrical equipment manufacturers and miscellaneous industries.

While the company's expansion from its original capacity has been accounted for partly by plant enlargement, the adoption of mechanized facilities and the development of labor-saving devices and practices have been important factors in increasing both total tonnage and efficiency of production. This mechanization has been concerned primarily with materials handling—some of it of a conventional nature, while other applications represent a departure from facilities commonly used in foundries. These features in



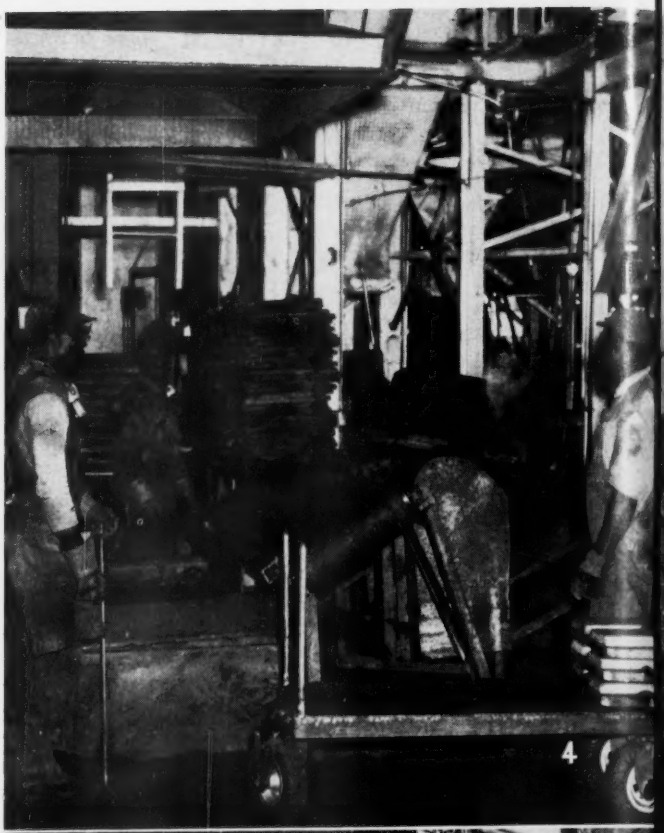
various of the plant's operations will be discussed first.

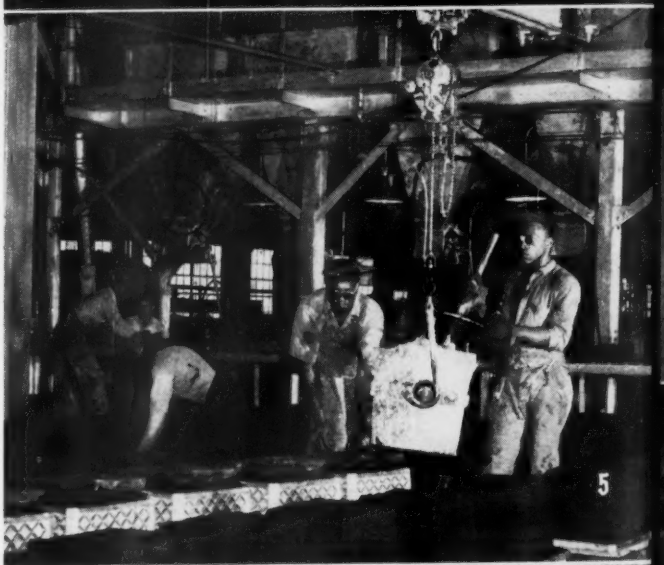
As indicated in several of the accompanying illustrations, molds are set out on gravity roll conveyors for pouring. Molten metal is transported from the air furnace in insulated ladles, and most molds are poured from ladles suspended by a hand or power operated hoist from a bridge crane. However, a few molds are poured from hand ladles. A jib crane assists in closing the larger molds. Fig. 2 shows the unit for making such molds. This unit consists of a rollover machine from which the drags are kicked out to a roller conveyor. Matching copes from an adjoining pin lift molding machine are picked up by air hoists, swung over to the drag as the latter moves into position, and the mold closed. This is a high-speed unit, considering the size of flask employed, turning out as many as 600 molds in eight hours.

Green cores are handled efficiently in the coreroom with the assistance of a conveyor belt passing along the benches and core blowing machines. This belt transfers the cores to a station where they are loaded on racks preparatory to being moved into any of ten batch type ovens.

A conveyor belt also is used at the shakeouts to collect bottom boards quickly and easily. As shown in Fig. 4, molds from the pouring lines are belt conveyed up a slight incline and slide over several rollers before dropping toward the shakeout screen. Just before reaching the screen the bottom board hits a stop along one side of an endless belt mounted at approximately a 45-degree angle. The mold continues to slide forward onto the shakeout, while the traveling belt moves the board to an operator stationed at the side who stacks it for subsequent return to the molding stations.

An efficient system likewise is employed in handling castings through the spruing and annealing operations. Sprued castings in tote boxes are moved by transfer car to several parallel roller conveyors leading to pot packing stations. Annealing pots are placed in position at the ends of these conveyors by an electrically operated trolley car, and moved away when loaded. Pots are packed by the chippers, and care is taken that both (*Please turn to page* 257)





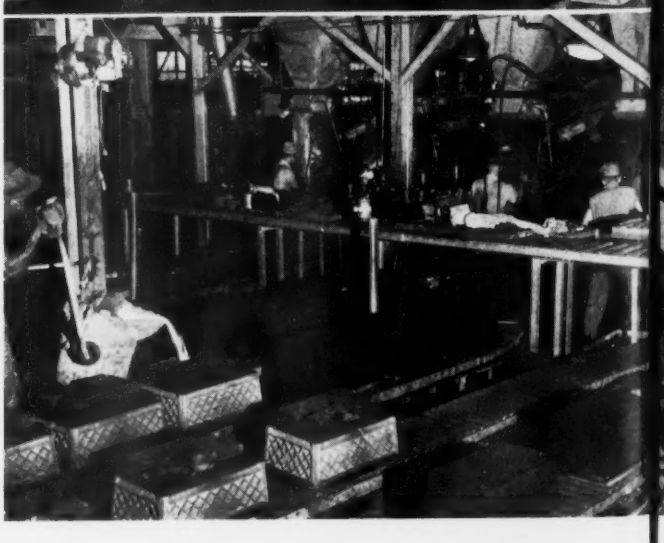


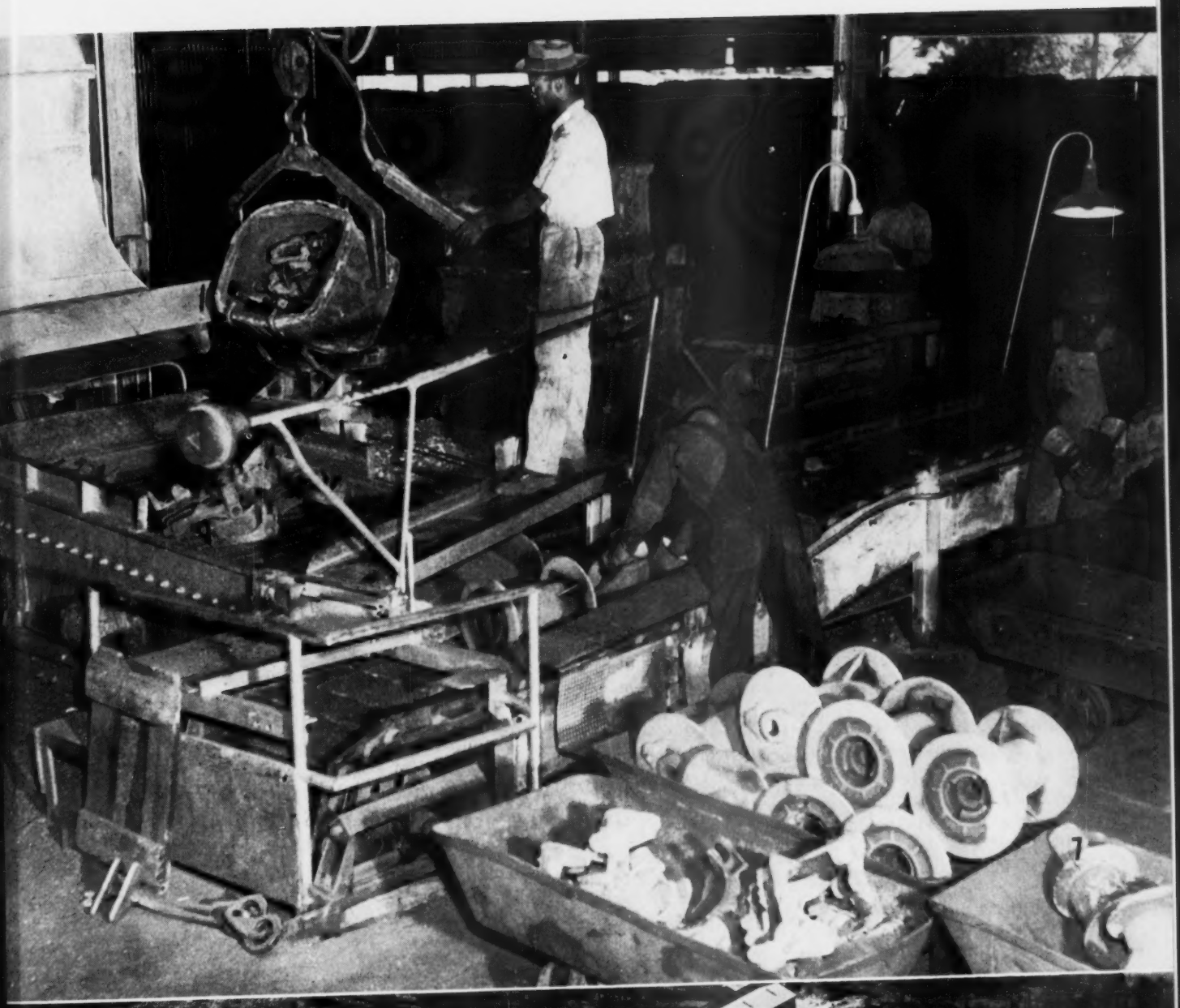
Fig. 4—Inclined traveling belt picks off bottom boards at shakeout as molds are dumped

Fig. 5—Pouring lines for cope and drag molding setup. The unit comprises six machines

Fig. 6—Most molds are poured from ladles suspended by a hoist from a bridge crane

Fig. 7—Emptying annealing pots. The shakeout moves castings to an apron conveyor for sorting. Gravel drops through the screen

Fig. 8—Aerial view of Texas Foundries Inc.



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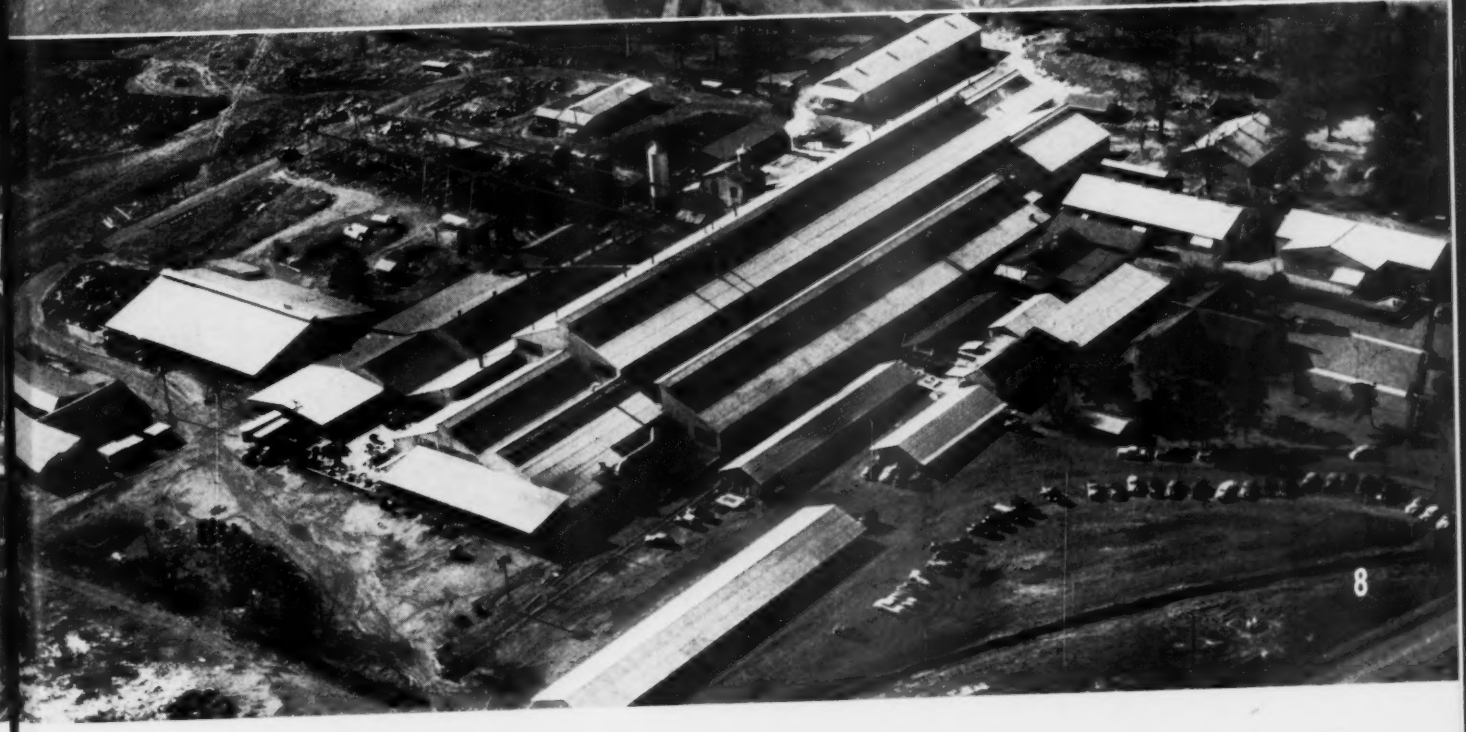

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By ELMER BLAKE
Osborn Mfg. Co.
Cleveland

DESIGN OF Coreboxes and Driers

FOR USE ON CORE BLOWERS

Important factors to be considered in designing coreboxes and driers used in core blowing are emphasized by the author in his description of how these parts are made for a typical core

THE core blowing machine was first introduced to the foundry coreroom about forty years ago. At that time, and for many years thereafter, the foundryman who decided to make use of the blowing principle of core production had to be a rather self-reliant individual. He had to work out his own technique for corebox rigging and sand preparation since the existing sand mixtures and coreboxes were in most cases unsuitable.

In the early days of development of the core blower, the various ingredients of the core sand mixture were not very highly developed. The usual procedure was to mix linseed-base core oil with sharp sand plus perhaps a little kerosene together with a dry binder—mainly dextrine—with the addition, in many cases, of a little bank sand. Whatever may have been the combination that finally worked, it was considered as information of a highly confidential nature.

The expertly prepared sand was shoveled into the hopper of this new type of core machine—a machine designed so that by proper manipulation of the valves, the sand in the reservoir was blown by compressed air through suitable holes into a corebox.

Certain preparations had to be made in the corebox such as the locating and drilling of the blow holes and providing means to allow escape of the air trapped in the box. Most of the venting done in those days was called joint venting. This was accomplished by scoring the box joint with a fine file to provide openings for air to escape, but small enough so the sand would not go through.

Progress was made slowly and the early successful users of core blowers found this method of making

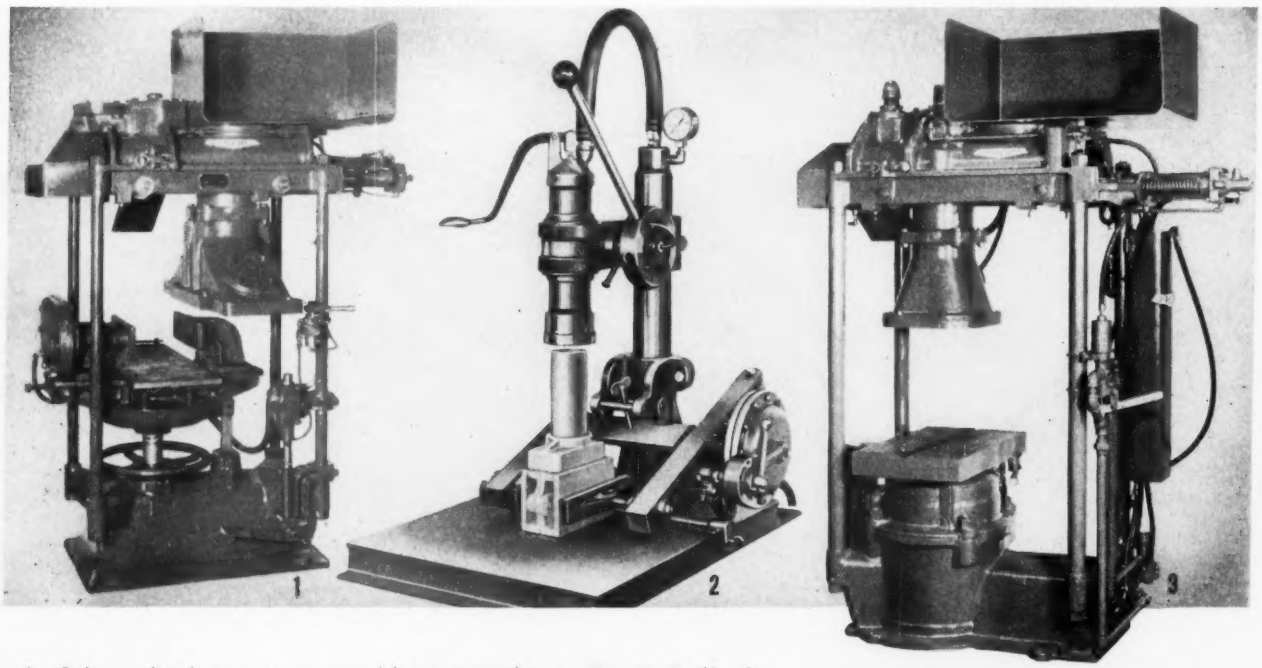


Fig. 1—Osborn diaphragm type core blowing machine. Fig. 2—Redford bench type core blower. Fig. 3—Osborn automatic draw type machine

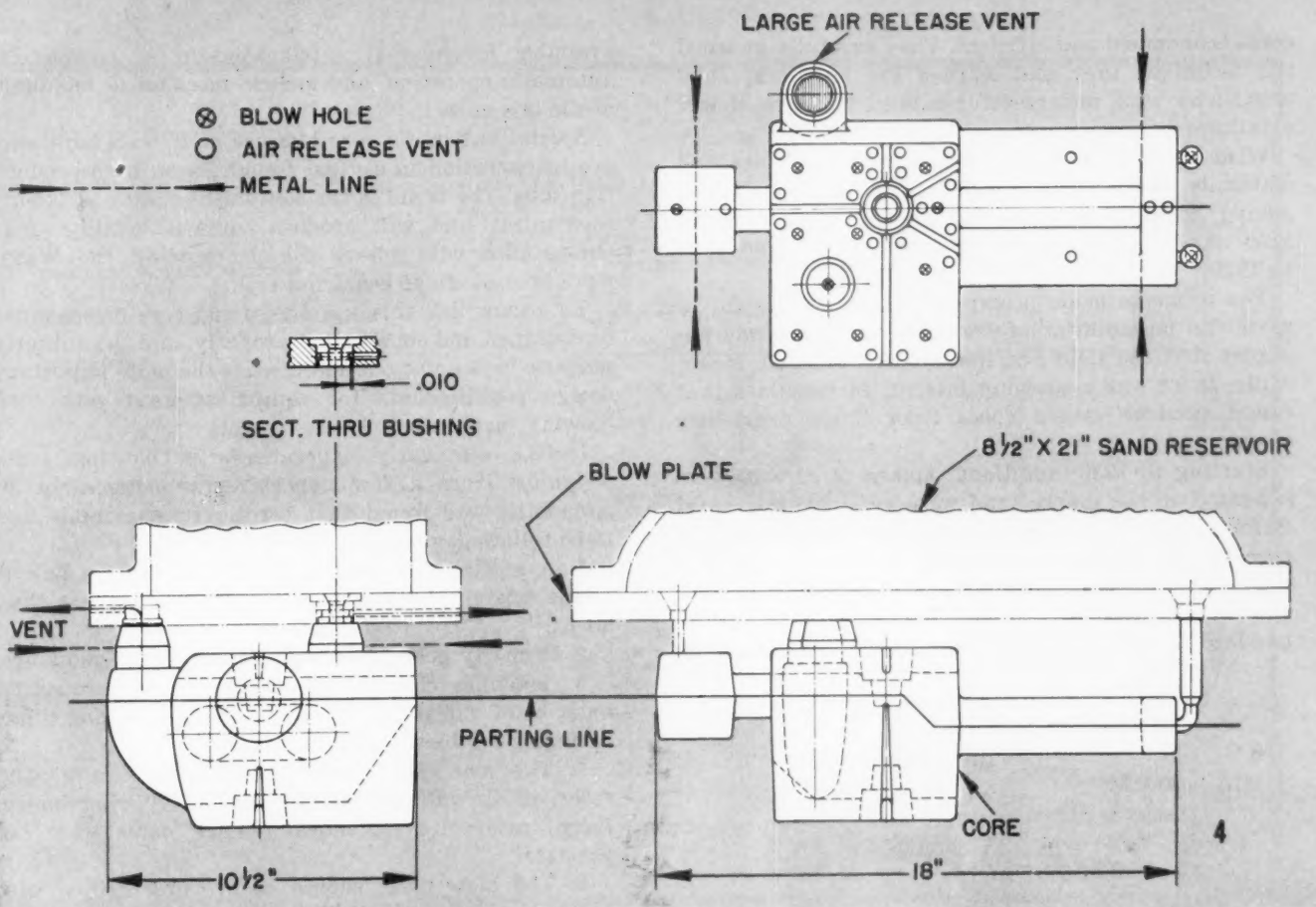
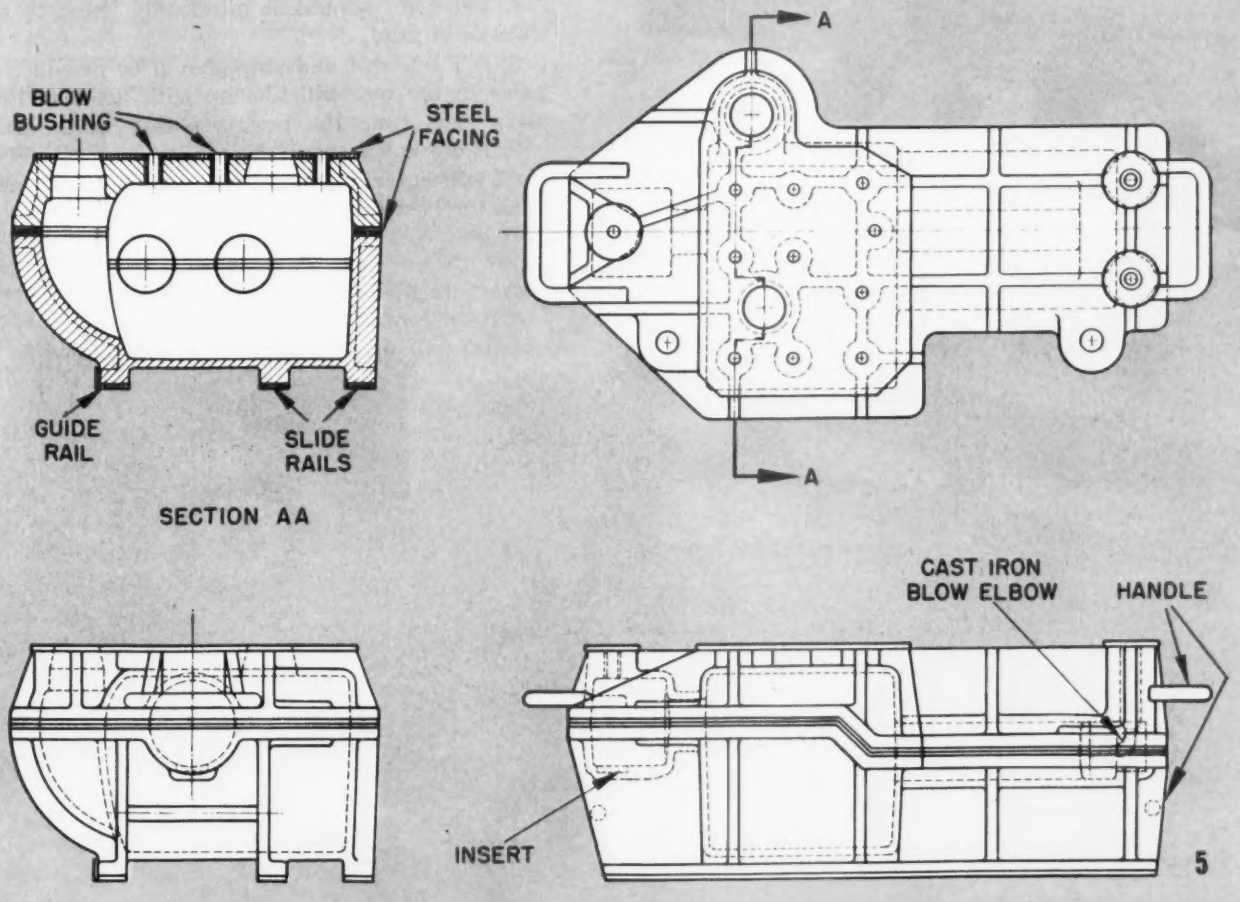


Fig. 4 (above)—Analysis of core to be blown

Fig. 5 (below)—Typical box rigging for blowing



cores economical and efficient. They carefully guarded the technique they had learned the hard way, and those who were unsuccessful dubbed the core blower a failure.

With the constant improvements in machines and materials, ideas and methods exchanged more freely among foundrymen and the art of blowing cores grew slowly but surely in the period from about 1920 to 1929.

The progress made prompted manufacturers to explore the possibilities of core blowing as it was apparent that the field had hardly been touched. Meanwhile, there was a growing interest in machines that would produce larger cores than those previously blown.

Starting in 1933, additional makes of core blowers appeared on the market and were available in several different sizes. During the last fifteen years, the greatest development in the use of core blowers has taken place. Today machines can be purchased to blow cores weighing from a few ounces up to several hundred pounds. Controls for these machines are available for manual, semiautomatic, or completely automatic operation, and include mechanical handling of the box as well.

Special automatic core blowers have been built and are in operation in several foundries on high-production jobs. The trend is for equipment that is efficient, economical, and will produce cores of quality—machines that will relieve the operator of the heavy work or operations requiring skill.

To accomplish this, coreboxes and core driers must be designed and constructed properly, and the author's purpose is to point out and discuss the more important design requirements for equipment used with core blowing machines.

During our early experiments in blowing cores weighing from a few ounces to approximately 20 pounds, it was found that certain fundamentals had to be followed, such as:

1. A sufficient supply of dry air through a line of ample capacity at a pressure in general not less than 80 psi.
2. Properly prepared sand with controlled moisture.
3. Machine clamps both vertical and horizontal must be of sufficient capacity to clamp the box tightly during the blow cycle.
4. The machine should be equipped with a sand reservoir of suitable size for the core being blown. Large reservoirs for blowing small cores were not practical.
5. The blow plate should be properly drilled with holes of proper size which accurately match those in the corebox.
6. The corebox should be machined parallel top and bottom and if clamped from the side, both sides should be parallel.
7. The joint should be accurately fitted to prevent leakage of sand.
8. A guide rail and stop should be provided so the holes in the box will line up with holes in the blow plate each time the box is placed in the machine.
9. Blow holes should be drilled and spaced so the sand will enter the box and pack the sand uniformly from the bottom up.

Fig. 6 — Typical example of a core drier in which weight has been reduced to a minimum without sacrifice of core support

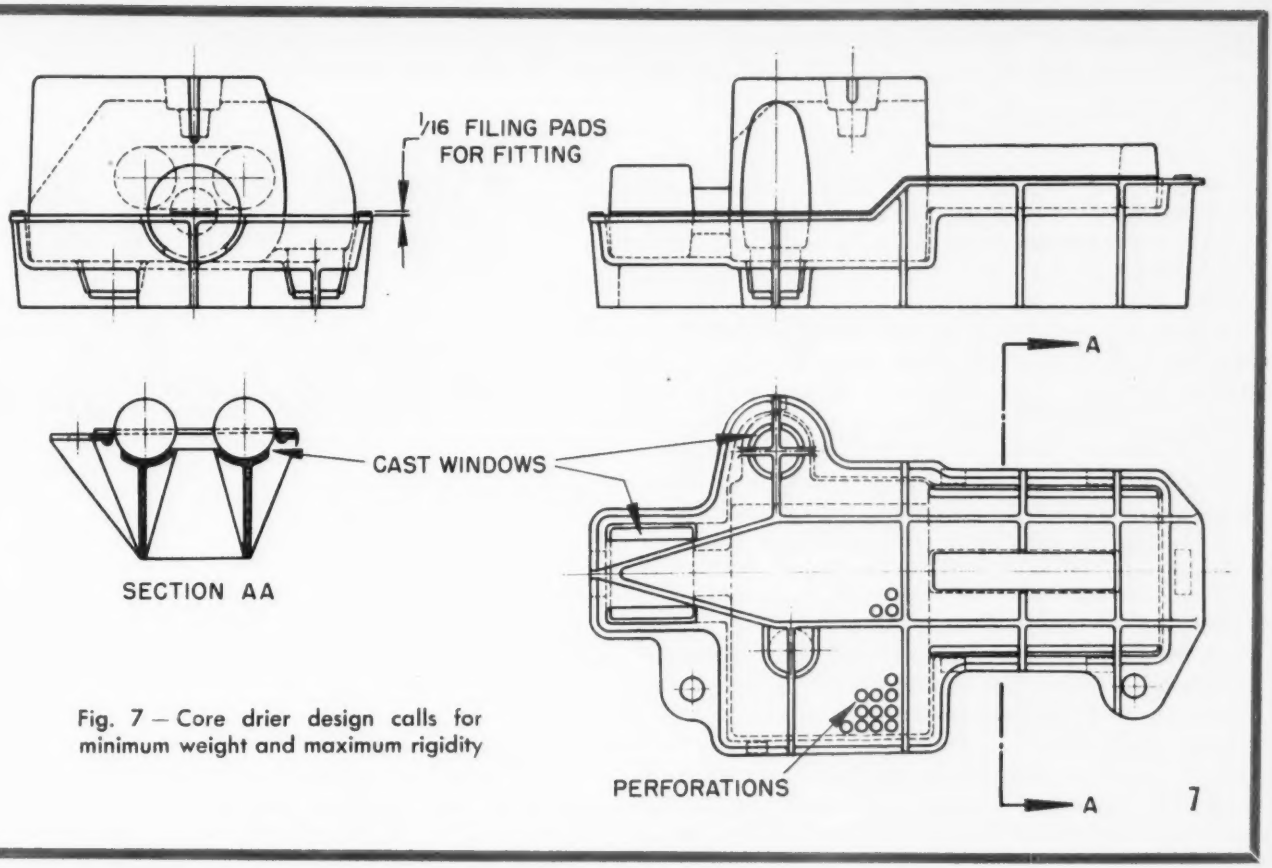


Fig. 7 — Core drier design calls for minimum weight and maximum rigidity

10. Air release vents have to be inserted at various locations to divert the sand stream to pockets and corners or around bosses. We found that vents in the lower part of the box were necessary, but they lose their efficiency when covered with sand; therefore, more vents are required in the upper half of the corebox.

We found that by following the above and analyzing a core before deciding how to blow it, and using good judgment as to where to place the blow holes and air release vent in the corebox, we could produce cores 90 per cent correct the first try. With very little extra work on the box or core sand mix, cores were made that were firm and would draw clean from the box and would hold their shape without sagging when going through the baking cycle.

Types of Core Blowers—The bench type core blower (Fig. 2) was placed on the market about 1943. Due to its simplicity of design and ease of corebox rigging, it was promptly accepted by foundrymen. It is recommended for blowing small cores ranging from a few ounces to about 2 pounds with a surface area of approximately 24 square inches.

The operation consists of filling the cartridge with sand by hand, placing the core box and cartridge in the machine, holding the cartridge tight to the box by applying pressure on the clamping lever, and pressing down on the blow control lever. The clamping lever must be held down slightly longer than the blow lever to allow exhaust air to escape, as this machine does not have an exhaust valve.

The diaphragm type machine (Fig. 1) is made in several sizes, blowing a range of cores from a few ounces to 15 pounds on the smaller size to 50 to 200 pounds on the largest machine. The maximum core surface area on the smaller machine is approximately 140 square inches and on the largest machine is about 600.

A machine designed to blow cores larger than a few pounds and with larger surface areas becomes more complicated in design. A method of moving blow head or sand chamber to the blow position over the core box should be mechanical. On this machine, it is accomplished by an air cylinder with spring return.

A sufficiently large air inlet to the machine should be provided so that when more and larger blow holes are used, the pressure drop from the blow valve to the core box is held to a minimum. An air inlet pipe of 2½ inches is recommended on the smaller size blower up to a 4-inch pipe on the larger size.

Air trapped in the sand chamber at the end of the blow operation has to be exhausted before unclamping the box; therefore, an exhaust valve must be incorporated in the design to do this quickly. Power clamps are required and must be of sufficient size to keep the box tightly closed during the blow cycle.

These various operations are controlled by one or two manually operated valves or by an automatic sequence valve that will move the flow head from fill to blow, clamp the corebox, blow the core, exhaust the excess air, release the clamps, and return the blow head to the filling position.

The draw type core blower (Fig. 3) is substantially the same as the diaphragm machine except that a cylinder and piston are used to perform the clamping operation. The upper half (*Please turn to page* 260)

Wetting A

—Useful in the Fou

WETTING agents have proved valuable for several years in the coal mining industry as a practical method of allaying coal dust. It has been only recently that the foundry industry has experimented with their potentials in certain operations where normal methods have been unsatisfactory in solving the ever-present dust problem. This treated water, commonly known as wet water, has been the subject of experimentation in our foundries for the past 18 months.

The New York State Department of Labor specifies that dust contamination in any foundry operation shall not exceed 30,000,000 particles per cu ft. It is generally agreed, by authorities, that the harmful dusts are considered those which are invisible or under 10 microns in size. The only two really practical methods of attacking and eliminating these harmful particles are ventilation or wetting. Since in certain dusty operations and conditions in every foundry it is difficult to ventilate, these spots have been closely surveyed for wet-water applications.

The cost of using wetting agents, detailed later, is surprisingly low for even the most complicated installations. The wetting agents used in our tests are very active and highly concentrated compounds which are instantly dissolved in any ordinary water under all temperatures. They are shown to be nontoxic, noncorrosive, odorless, and harmless to skin and clothing. Our experience has disclosed no harmful effects from their use.

Action of the wetting agent on dusts is simple and effective. Unlike regular water, which tends to run off a dry surface or form globules, treated water releases its surface tension which, in turn, allows it to penetrate the material readily. Wet water quickly penetrates siliceous materials. An average coating will go into a dry sand bed 2 to 4 inches. Treated water has the unique quality of working into the material until it has exhausted itself. Breaking the wet water into a fine spray provides an excellent medium for absorbing dust particles in the atmosphere and effectively smothering the potential airborne particles in a polluted area. A low-capacity mist is considered the most effective method. On floor areas a spray of larger droplet size is equally effective.

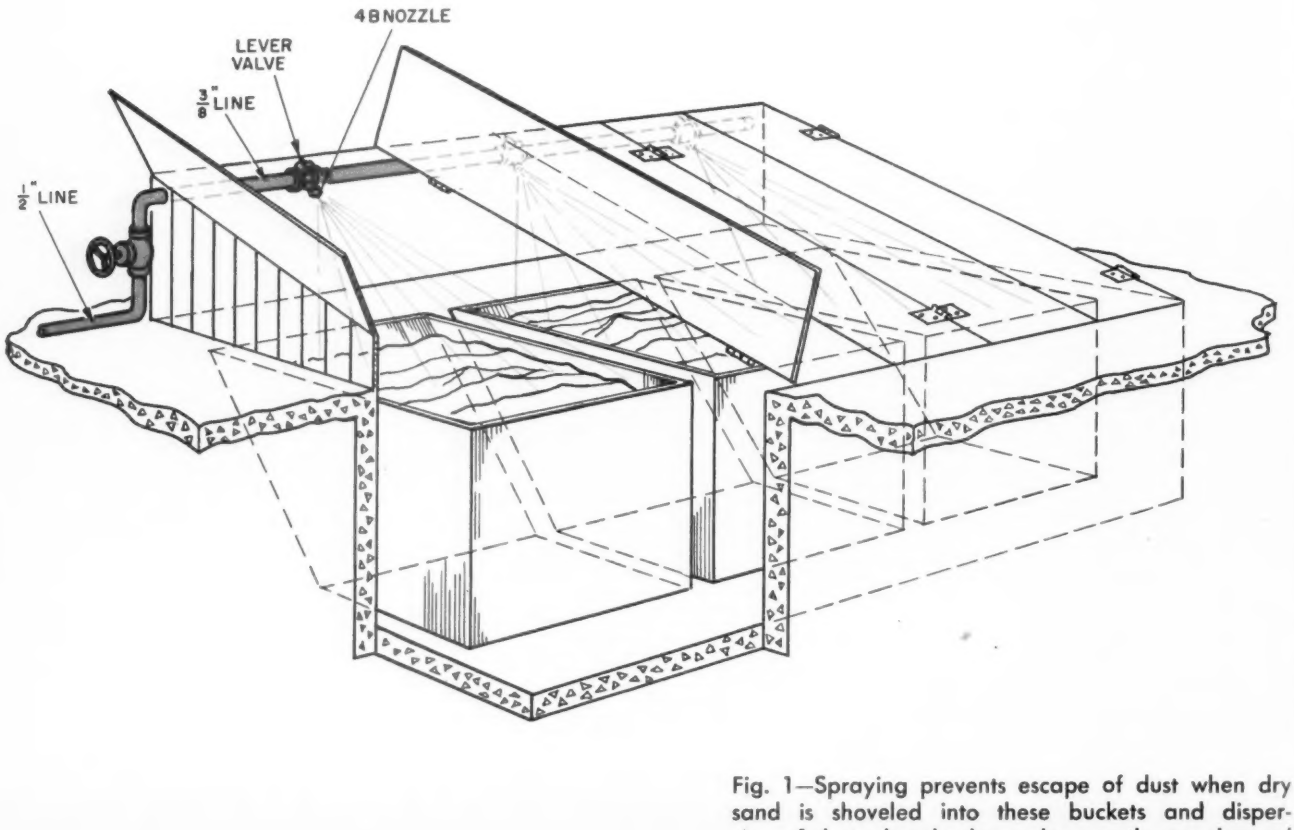


Fig. 1—Spraying prevents escape of dust when dry sand is shoveled into these buckets and dispersion of dust when buckets subsequently are dumped

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gAgents

Foundry

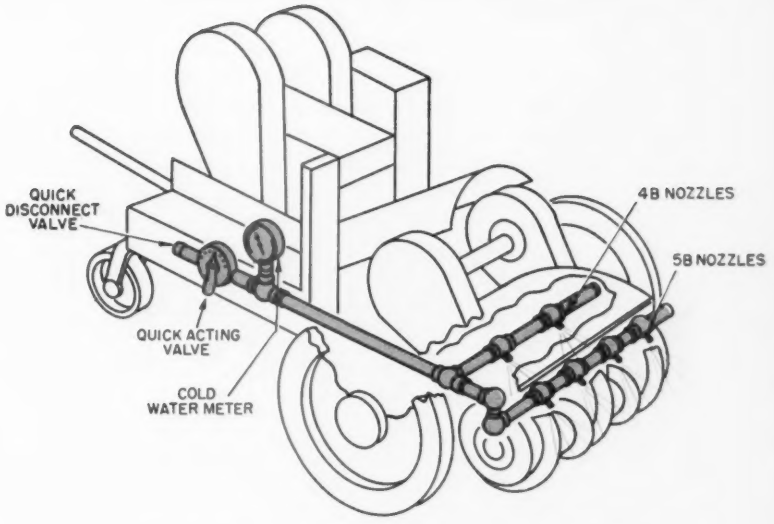

Fig. 2—Showing how spray nozzles are mounted on machine for floor cutting of sand. Wet water adds moisture to sand and prevents generation of dust

Value of wetting agents in solving dust problems has been proved in various industries. The author describes how so-called wet water has been employed by General Electric Co. at its foundries to improve working conditions in several normally dusty operations

It is hoped that some of our experiences with wetting agents will be of value to the reader. We entered this field uninitiated, but since that time we feel that we have learned a great deal, and in so learning, our enthusiasm for potential abilities of the agents has increased.

A good example of the penetrating qualities of wet water can be found in our core knockout operation. Before the core is dug out of the casting it is sprayed amply with wet water. Action of this water softens the core and allows it to be dug out with a minimum of dust and effort. The operator, by having a hose at hand, is able to repeat the process as often as necessary as he hits dry spots in the core. When the core scraps are shoveled into a bucket, and when the bucket is dumped into a truck, the absence of the usual dust is very noticeable.

Spraying of aisle-ways has proved to be one of the most important factors in dust elimination. Two methods of spraying are employed. One is with a power floor sweeper which carries a water tank piped to three spray nozzles in front of the brush. This sprays the gangways with treated water ahead of the rotary brush which sweeps the dampened sand into a hopper. The sweeper completes a circuit of the plant aisles about every two hours, assuring a constant moistened effect. This unit has readily proved its value in making the foundry a better place to work. In areas the sweeper does not travel, hoses are available to spray the floor with wet water several times a day.

Another advantage of wet water is that, because of its penetrating qualities, a floor area treated with it will stay damp longer than when sprayed with plain water. This value is readily noticed in the summer months, especially around the shakeouts where a cooling effect is obtained by this action. We have found that an application of wet water on passage ways is good for about two hours and around the shakeouts for one hour.

Several tests were made on vibrating shakeouts with both straight water sprays and air-water atomized spray. This application is not too successful at present since it is difficult to control the spray against the operation, plus the danger of over-wetting the hot castings. Further investigation will be required for a practical solution.

Experiment with Muller Operation

Extensive testing was carried on in mulling operations. Several spray tests were made for the purpose of allaying dust in the muller. We also sought to find out what benefit, if any, could be gained from using wet water instead of regular water in our sand mix. Although we were unable to establish conclusive results, it is our opinion that there are latent possibilities in its use. The tests indicated that a molding sand mixed with wet water shows more strength and toughness with less water used than when plain water was added.

Sand cutting proved to be an excellent medium for wet water usage (Fig. 2). On the cutters were mounted four No. 5B Spray Engineering Co. nozzles across the top of the hood and directly over the cutting blade. Back of the hood behind the cutting blade, two No. 4B nozzles were located. A quick-action valve controlled the flow of wet water to the six nozzles. With this arrangement, one pass of the cutter usually

places the proper amount of moisture into the pile and prevents dust from being thrown out. If the pile still lacks some moisture, the spray is used partially during the second cut. The results have been very encouraging. A great portion of the dust is eliminated from the operation. The sand mix shows improved quality and less water is required.

A cold-water meter can be mounted on the cutter to enable the operator to measure the proper amount of water into the pile. We have tried to eliminate all of the guesswork in this application without increasing the operator's duties. It is planned to mount a retractable hose reel on the cutter so that, as it travels into the floor and out again, the hose will automatically wind.

The cartridge proportioner unit (Fig. 3) is ideal for installation in isolated locations or where its usage is required for concentrated operations. The coreroom and mold department at the G-E Elmira, N. Y., foundry is suited for such an installation. The only difficulty met with this unit was the operator's negligence in not shutting off the proportioner, and allowing it to drain after use. We have since placed printed signs on each proportioner with operating instructions.

Install Wet Water Pressure System

Since another of the company's foundry facilities at Elmira had so many applications covering the entire building, it was decided to install a wet-water pressure system layout. A 3-in. main water line for carrying the wet water was laid along the center column line north to south. From this main line ¾-in. pipe lines were dropped down each column with a quick-disconnecting water coupling valve attached to the end of each line. At each end of the building a liquid proportioner unit with a water turbine pump, as shown in Fig. 4, was installed. The north pressure pump unit supplies the building, with the south unit as a standby. This unit furnishes the building at any connection a treated water supply at 80 lb pressure.

Pressure wet water will be planned for the overhead sand system walkways in the near future. The operators on the system can then keep their aisles dampened and swept clear. This will eliminate dry sand being agitated over the molders' heads and being carried into the atmosphere. Each department is supplied 50-ft lengths of ½-in. heavy-duty water hose with a quick-disconnect coupling on one end and a recommended spray nozzle on the other. With the pressure system an operator can walk down through the aisle and snap his hose onto the most convenient outlet for wetting down the floor or aisleways. In the sand cutting operation, the operator can quickly connect his hose to a wet-water line and to the connection on the cutter as he moves from floor to floor.

In shaking out castings in a heavy floor molding foundry, wet water can be very useful. A series of spray nozzles can be mounted under an overhead bridge crane, with a hose and reel running to the wall where it can be easily connected by the crane operator. As the crane lifts the mold, the shakeout flask vibrator is turned on. The crane man can throw a valve which will concentrate the spray on the mold. This spray, which has been proved in other tests, can be balanced so that it will absorb the rising dust particles and carry them down. With a proper balance in the spray, there is no danger of over-wetting, since the heat will dissipate the moisture rapidly, but not until its effective wetting action has been completed.

Nozzles and Their Applications—For core knockout work we use Spraco 5B nozzle full cone, 2.7 gpm, and Spraying Systems Co. full jet ⅜ GG 9.5 full cone, 2.7 gpm, both at 80 lb pressure. For aisle floor wetting we use: Spraco 4B nozzle full cone, 1.35 gpm; full jet ¼ GG 6.5 full cone, 1.80 gpm; full jet ¼ TT 8006 flat atomizing, 0.84 gpm; full jet TT 8010 flat atomizing, 1.40 gpm, all at 80 lb pressure. We are at present using the ¼ TT 8006 nozzle for hand spraying aisles and the ¼ TT 8010 nozzles on the power floor sweeper.

In the company's Elmira operation we were faced with the problem of eliminating dust at what is termed a hand scrap-off pit. This is not a general application because many foundries do not have this type of setup, but most of them have similar types of conditions. In our layout (Fig. 1) three buckets are set into a pit, their tops being slightly beneath the level of the floor. Dry sand is shoveled into these buckets as it accumulates. A railing across the face of the pit is at waist level. Over each bucket and mounted to the railing was placed a full cone nozzle, 0.95 gpm at 80 lb pressure. The operator can turn any or all of these nozzles on when he starts shoveling. The result—very

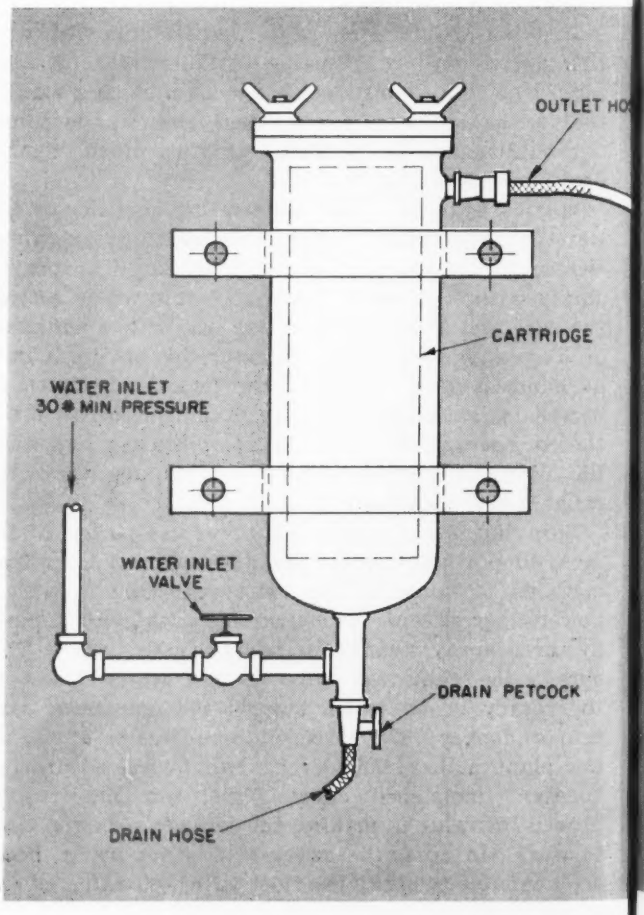

Fig. 3—Cartridge proportioner unit for wet water

little dust escapes during the operation and the bucketful of lightly dampened sand can be dumped anywhere with a minimum of dust dispersion.

In the floor shakeout operations we have been most successful with full cone nozzles not exceeding 2.7 gpm at 80 lb pressure. If this size is exceeded, effective atomization is lost. When the droplets become too large the absorption qualities suffer.

Insofar as area is concerned, it is better to bank a sufficient number of nozzles and try arrangements until it fulfills your requirements. Over-wetting, in many cases, has been the discouraging factor; now we use the smallest spray nozzle that will do the job.

The cost of wet water applications against value received is its real selling factor. One thousand gallons of treated water from a liquid proportioner unit cost $4.19 or 0.00419 per gallon. Cartridge proportioner units are less than $100. Liquid proportioner units, including pump and motor, would cost less than $600. The only additional investment would be labor, pipe, hose and nozzles. Nozzles average less than $3 each.

The Elmira Works consumes an average of approximately 100 gallons of wet water per day. This figure will decrease in cooler weather as the evaporation rate on the floors and aisles is lowered. One full-time operator mans the power floor sweeper throughout the plant during the day. Even with this consistent application each department keeps its aisles moistened with its own help, in order to insure a dust-free atmosphere.

As a matter of interest, if one of the No. 8006 nozzles at 80 lb pressure were allowed to spray continuously for eight hours, it would consume only 360 gallons of water and $1.18 worth of wetting agent. This water, when properly applied, would coat an aisle 12 ft wide and 9600 ft long.

It is felt that we have only scratched the surface of wet-water applications in the foundry. Several possibilities have been placed on our list of future plans, as they will require a great deal of close concise testing before their value can be assumed to be really practical. Sand conditioning is a good example of this. We feel that in time a good workable method can be established for automatic and semiautomatic shakeout operations.

Wetting agents should have a definite place in every foundry, large or small. There are at least two or three good applications for them regardless of conditions. The psychological effect on employees of wet-water installations also is beneficial.

The power floor sweeper, which cost approximately $1000, likewise proved to be a worthwhile investment. Originally it was planned to use it also on the paved roadways outside the foundry for clean-up work. After it was placed in operation it made such a vast difference in the internal cleanliness that it has been kept inside the buildings exclusively.

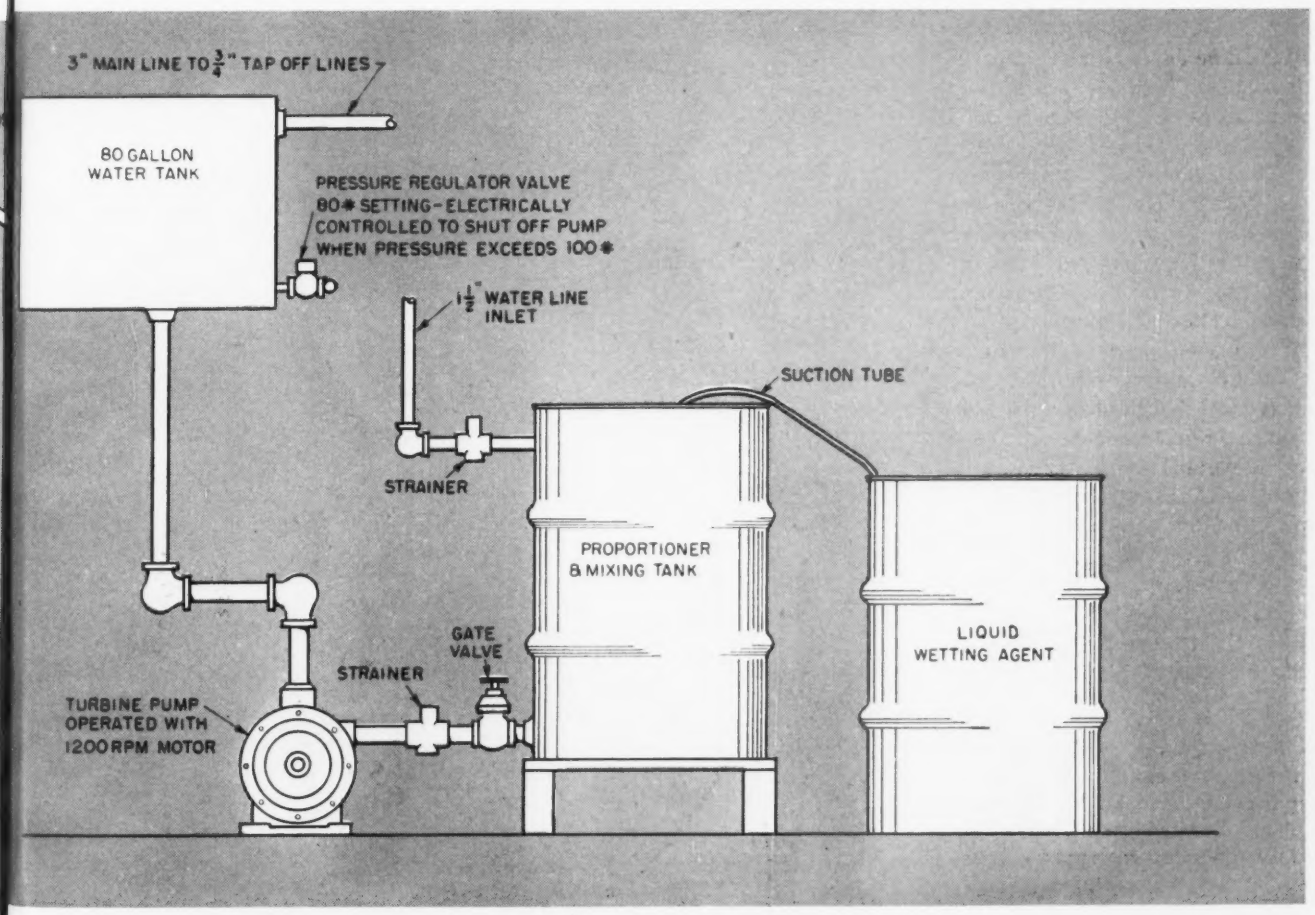
3" MAIN LINE TO ¾" TAP OFF LINES
80 GALLON WATER TANK
PRESSURE REGULATOR VALVE 80# SETTING - ELECTRICALLY CONTROLLED TO SHUT OFF PUMP WHEN PRESSURE EXCEEDS 100#
1½" WATER LINE INLET
SUCTION TUBE
STRAINER
PROPORTIONER & MIXING TANK
LIQUID WETTING AGENT
GATE VALVE
STRAINER
TURBINE PUMP OPERATED WITH 1200 RPM MOTOR

Fig. 4—Arrangement of liquid proportioning pressure unit

Nickel-Alloyed MANGANESE B

IN A SIMPLE statement, manganese bronze might be called a 60 per cent copper —40 per cent zinc yellow brass to which has been added 1 per cent each of aluminum, iron and manganese. Usually, the addition of 1 per cent of each of these elements produces the common low-strength grade.

The drive toward higher strength requires a multiplication of the percentage of hardener elements (iron, aluminum and manganese) by 2 or 3, until the compositions begin to resemble aluminum bronzes, which are zinc-free alloys. If you omit the zinc and increase aluminum, you produce the aluminum bronzes. If you reduce the zinc to 20 per cent and add 20 per cent nickel, you enter the composition range of the nickel silvers. Nickel fits into both families of alloys as a grain refiner, corrosion and erosion resistor and alloy diffuser in the complex metallurgy of these materials. Large amounts of nickel—in the 10 to 20 per cent range—make the corrosion-resistant nickel silver family of alloys out of the yellow brass base. These alloys will be dealt with separately.

Manganese bronzes and aluminum bronzes might be considered as aluminum alloyed companions of a brass base and copper base metal, respectively. In the zinc-free copper-base alloys, aluminum in amounts up to 15 per cent develops the family of aluminum bronzes. These bronzes are further improved with additions of iron, nickel and manganese. They possess high fatigue strength, good corrosion resistance, heat resistance, elevated temperature stability and heat treatability. The aluminum and manganese bronzes are comparatively free from tin and, therefore, become important challengers for high-strength applications in the bronze market.

The American Society for Testing Materials defines manganese bronze as "a copper-base alloy containing more than 17 per cent zinc with iron, aluminum, manganese, tin and nickel exceeding a total of 2 per cent." (ASTM Standard Classification B119-45, *ASTM Standards,* 1949, p. 122.) The definition further requires "tin to be less than 6 per cent, silicon less than .50 per cent, and lead close to zero or not exceeding 1.50 per cent for the leaded grade." Actually, tin contents up to .50 per cent are expected to retard dezincification at the expense of a discount in ductility. Larger amounts are rarely used.

Lead is also known to be detrimental to the development of tensile strength, and experience indicates that for maximum strength, lead should be limited to very small amounts not exceeding .05 per cent or, in some cases, as low as .02 per cent. Nickel additions of 1 per cent are commonly made to manganese bronzes to assist in the diffusion of iron and to retard the pitting and dezincification effects. Fre-

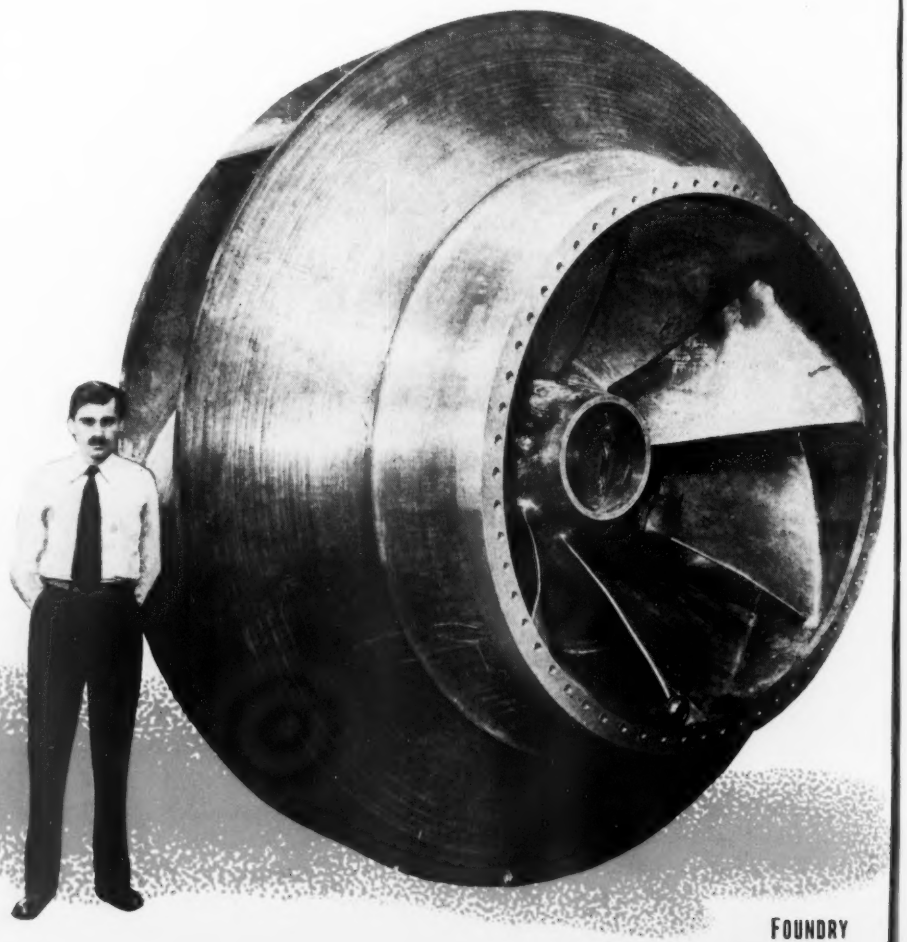

Fig. 1—This 24-ton impeller was cast from Turbine Metal, a nickel-alloyed manganese bronze, for the Worthington Pump & Machinery Corp. Photo courtesy American Manganese Bronze Co., Philadelphia

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BRONZE

In this sixth of a series of articles describing the properties, applications and production of nickel-alloyed bronzes, the author discusses characteristics and foundry practice applicable to manganese bronze

quently, nickel is used in amounts up to 3 per cent for this purpose with favorable effects upon the mechanical properties, in addition to improving corrosion resistance.

Foundry Practice—Manganese bronze, as mentioned previously, is really a brass alloyed with aluminum, iron and manganese. Virgin metals, refined ingot or clean brass scrap of known origin may be used as a base material, and appropriate additions of the required alloys made individually or by way of "hardener." Care in maintaining cleanliness during the mixing and melting operation is a routine requirement if contamination by undesirable elements is to be avoided and the expected mechanical properties developed. Impurities such as lead, bismuth, arsenic, carbon, silicon, etc. are harmful and must be kept out of the metal or under close control. Nickel additions to manganese bronzes may be added to the charge at the beginning of the heat. In view of the need to avoid contamination, pure nickel, such as Electro or QM Squares, represents the form best able to maintain high purity. Commercial copper-nickel shot, which may occasionally be on hand, may be contaminated with lead or other undesirable ingredients. A purity of 99 per cent, with less than .10 per cent lead, eliminates most of the risk.

Melting, casting and molding practices for the nickel-alloyed manganese bronzes do not differ appreciably from regular manganese bronze practice.[1] The procedures of melting, casting and molding require refinements which become fundamental factors in the successful production of manganese bronze castings. These refinements present a challenge to foundrymen which has been met by the skillful application of the special practices designed to eliminate undesirable effects. Control of the composition prior to pouring is usually accomplished by making a preliminary bend test upon a test slug which, with a hardness test, and a fracture, can establish whether a small addition of zinc or copper is needed to bring the composition into proper balance. This refinement in melting, along with care in maintaining purity, is supplemented by heating sufficiently to produce flaring, and finally cooling the metal to a proper pouring temperature.[1] Its aluminum content makes it susceptible to drossing. The attendant risk of trapping aluminum oxide in the castings increases the difficulty of producing pressure castings.

At this stage of handling, further care is applied in skimming the dross at the mold, by the use of chokes, strainer cores, etc., while running the casting to produce the least possible mold erosion and turbulence. Manganese bronze is a member of the high-shrinkage family of cast copper-base alloys. Casting designs that promote directional solidification are helpful. Chills are frequently necessary on castings of irregular section. The application of ample risers, properly placed, completes the essentials for the production of sound castings in this high-shrinkage material.

Metallurgy—Yellow brass, which is the base solution for manganese bronze, contains two structural components, namely alpha (low zinc) and beta (high zinc) brass. Aluminum does things to copper-base solutions. Presumably, the aluminum and, to a lesser extent, iron, nickel and manganese, act upon the alpha phase which may occupy less than half of the total structure in manganese bronze. Aluminum

TABLE I—Specification* Levels for Several Manganese Bronzes

Class	Tensile Strength	Yield .20% Offset	Elongation
7A	60,000	20,000	15
8A	65,000	25,000	20
8B	90,000	45,000	18
8C	110,000	60,000	12

* ASTM Specification B147-49, ASTM *Standards* 1949, Part 2, Non-Ferrous Metals, pages 207-210.

TABLE II—Corrosion of Various Bronzes in Circulating Sea Water

Metal**	Cu	Sn	Al	Fe	Pb	Mn	Zn	IPY***	% Loss in: Tens. Stgth.	% Loss in: Elong.
Manganese bronze	65	..	6	2	..	4	23	.0036	8	97
Leaded bronze	75	10	..	..	15	..	..	.0036	0	0
Aluminum bronze	95	..	5	..	..	..	..	.0016	5	13
Aluminum bronze	89	..	10	1	..	..	..	.0011	14	73
Tin bronze	92	8	..	..	..	..	..	.0011	1	1

* From Report of Subcommittee VII of ASTM Committee B-3, *Proceedings*, ASTM, 1935, Part I, p. 141. ** Specimens exposed 243 days in a circulating water suction well in sea water at Bridgeport, Conn. No aeration or agitation. Temperature 37° to 74° F depending on season of year. *** IPY=inches penetration per year.

TABLE III—Corrosion of Bronzes and Cupro-Nickel in Salt Spray

Metal*	Cu	Sn	Al	Fe	Pb	Mn	Zn	Ni	IPY**
Mn bronze	Bal.	..	4	..	..	..	22	..	.0031
Al bronze	89	..	10	1	..	..	..	..	.0021
Bronze	88	8	..	..	..	..	4	..	.0016
70-30 Cu Ni	70	..	..	..	..	..	..	30	.0007
Al Monel	25	..	4	..	..	..	..	70	.0003
Monel	30	..	..	..	..	..	..	70	.0001

* Specimens exposed 500 hours actual spray time in spray box exposed to 4% sodium chloride (evaporated sea salt in distilled water). Temp. 60° to 78° F. Aerated. **IPY=inches penetration per year.

TABLE IV—Tests in Flowing Sea Water

Exposed 1928 days at Kure Beach, N. C.

Metal	Cu	Ni	Zn	Mn	Al	Fe	Mdd*	Max. Pitting Mils**
Cast Mn bronze	58	..	39	1	1	1	9	6
Cast Mn bronze	55.5	2.5	39	1	1	1	3	2

*=corrosion rate in mg per dq. dm per day. **=thousandths of an inch.

in large amounts becomes able to exercise pronounced effects upon the structure which are registered in the improved strength and hardness values. By contrast, aluminum bronzes which would not contain the beta or zinc-rich constituent, require 10 per cent or about twice as much aluminum to develop the same order of strength that is obtained in the yellow brass called manganese bronze.

Mechanical Properties—The strength and toughness of manganese bronze is comparable to that of cast steel. Typical specification ranges for tensile properties are shown in Table I.

It provides a high-strength material for many applications such as machinery frames, waterworks valves, pumps, ship propellers, rudders, and similar cold-water uses. It has occasionally been misused for elevated temperature applications, presumably in the belief that its high strength at room temperatures is sustained at elevated temperatures. Actually, it maintains the high temperature workability of the beta brasses and consequently is plastic and weak at elevated temperatures. Tin and nickel-tin bronzes with half the room temperature strength will excel it for strength at elevated temperatures, as shown in Table V.

Nickel is added to manganese bronzes mainly to improve corrosion resistance, by providing a more tenacious surface film and retarding corrosion penetration or dezincification. Sheehan and Dickerman[2] point out that strengths in the 70,000 to 80,000 psi range represent a desirable limit since higher strengths are liable to lead to stress-corrosion failures. Feltrin[3] describes the following composition in use for marine propellers in sizes up to 20-foot diameter: Cu 56-58, Zn 37-41, Ni 1.00, Mn 0.50-1.00, Al 1.10-1.30, Fe 0.90-1.10, Sn 0.40-0.60.

Nickel additions of the order of 2 per cent have been made to manganese bronze for such important castings as the propellers for large ships. Large castings for pumps and similar corrosion resisting applications are regularly made in Turbine Metal[4], a 3 per cent nickel-alloyed manganese bronze (Fig. 2).

Corrosion Resistance—In the procession of copper-base alloys, corrosion resistance, particularly in water or sea water, progresses from the brasses to the bronzes and then toward the cupro-nickel alloys. In this progression, semired brass (10 per cent zinc) would be expected to be superior to yellow brass (20 per cent plus zinc); red brass (5 per cent zinc) superior to semired; and tin, aluminum and silicon bronzes which do not contain zinc, would be superior to the brasses. The more noble cupro-nickels and their special iron, silicon and aluminum-alloyed relatives would top them all. Corrosion data confirm this generalized gradation, as shown in Tables II and III.

Manganese bronze, with its high zinc content, would be expected to be affected by its yellow brass ancestry. The high zinc content of manganese bronze usually leads to more rapid corrosion than that encountered in corresponding zinc-free high-strength bronzes such as the 5 per cent nickel alloyed aluminum bronze. The corrosion data quoted in Table II and III for the aluminum bronze and manganese bronze, may offer some measure of comparison. Within each family group of this classification, nickel additions would be expected to improve the resistance to corrosion attack. This is illustrated for manganese bronzes in Table IV. Nickel additions of about 3 per cent are frequently used.

As is true with yellow brasses, the appearance of manganese bronze under conditions causing corrosion is deceptive because the internal structure is attacked while the surface appears to be unaffected. Weight losses in corrosion tests become misleading. Corrosion damage may be more difficult to determine by surface inspection because corrosion proceeds by invading the internal structure. This type of corrosion disease is called "dezincification". The corrosion attack proceeds along intergranular channels which gradually project and extend the damaged area. In its progress, the zinc in the metal is leached out of the alloy, leaving a microscopically porous residue structurally resembling coke or cork. The loss in strength and especially in ductility recorded in Table II registers the extent of this type of damage.

Propellers and Impellers—Manganese bronzes are employed for a variety of large and small propellers for marine service. In this application, erosion or cavitation is certain to be more damaging than normal or slow-motion corrosion. Corrosion resistance,

TABLE V—Elevated Temperature Properties of Manganese vs "G" Bronze

Alloy	Cu	Zn	Al	Ni	Fe	Mn	Sn	Pb	— Room Temp. — Tens. stgth., psi	— Room Temp. — Elong., per cent	—— 400° F —— Tens. stgth., psi	—— 400° F —— Elong., per cent	—— 600° F —— Tens. stgth., psi	—— 600° F —— Elong., per cent	—— 800° F —— Tens. stgth., psi	—— 800° F —— Elong., per cent
Mn bronze (Extruded) ...	55.1	41.89	.07	.28	.84	.36	.77	.52	89,600	21	53,800	35	33,600	50	11,200	60
"G" bronze	88.0	2.0	..	..	..	..	10.0	..	38,100	17	33,600	15	26,900	4	18,000	2
Ni "G" bronze....	82.0	4.0	..	3.5	..	..	10.0	..	35,800	25	31,400	23	26,900	15	24,600	8

TABLE VI—Mechanical Properties of Sand-Cast Nickel-Alloyed Manganese

Alloy	Cu	Zn	Al	Ni	Fe	Mn	Sn	Yield Strength, psi	Tensile Strength, psi	Elong. in 2", per cent	Bhn
Manganese bronze	57.2	41.0	0.3	..	0.7	0.8	..	33,600	71,700	25.0	129
Turbadium	*50.0	44.0	..	2.0	1.0	1.75	0.5	38,100	85,100	18.0	154
Turbine metal	56.0	36.0	1.0	3.0	1.0	2.0	..	39,900	80,000	20.0	166
High-tensile brass**...	60.0	34.0	3.0	3.0	..	..	..	37,200	82,200	19.0	125
High-tensile brass**...	60.0	31.5	4.1	3.0	1.45	..	..	52,400	99,600	12.0	159

* Turbadium Bronze. ** Also used to describe "manganese bronze." Note: The endurance ratio (fatigue limit/tensile strength) of high-tensile brass having an alpha beta structure is 0.33, and 0.21 when the structure is all beta.

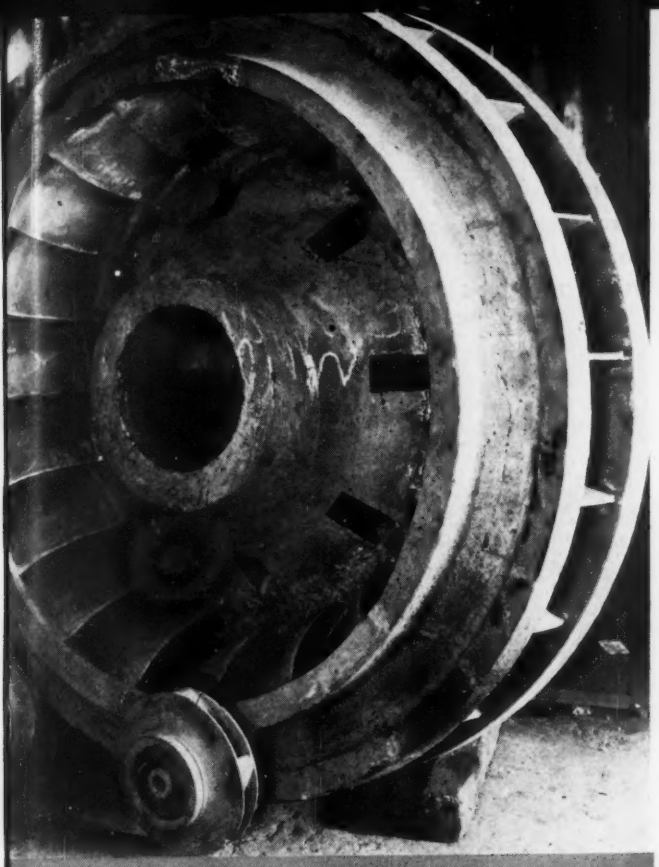

Fig. 2—Nickel-alloyed manganese bronze hydraulic pump and turbine rotors. Photo courtesy American Manganese Bronze Co.

which is a basic requisite in copper-base alloy applications, is apt to be impaired in the high-strength manganese bronze. An earlier trend, particularly in connection with large manganese bronze propellers for modern high-speed ships, led to an increase in the tensile strength of the metal but invited the risk of failure by fatigue or corrosion fatigue.

The structure in the high-tensile manganese bronzes is apt to be coarse grained. The fatigue strength remains low for the high tensile strength that is developed. The alpha phase which provides the toughness characteristic of red brass or of brasses of the low zinc content type, is crowded out of the microstructure. The less plastic beta structure which is typical of high tensile manganese bronzes takes over. Sheehan and Dickerman[2] pointed out that an alpha plus beta structure is less susceptible to stress-corrosion even though such a structure is accompanied by a lower tensile strength. The lower strength manganese bronze is consequently much more commonly used. When alloyed with up to 3 per cent nickel, an improvement in corrosion resistance is achieved without sacrificing any of the remaining, basically desirable characteristics (Fig. 1).

Cavitation-Erosion—With the introduction of modern high-speed turbines came a corresponding increase in propeller surface speeds, leading to cases of severe cavitation. An investigation of this situation at the time evolved a manganese bronze called "Turbadium" which was extensively used for large marine propellers. Turbadium propellers, as supplied for the *Queen Mary* as well as for British warships, had a

TABLE VII—Resistance of Manganese Bronzes to Cavitation Erosion

Alloy	Yield Stgth., psi	Tens. Stgth., psi	Elong., per cent	Bhn	Erosion Loss*
Ordinary manganese bronze		65,500	42.0	96	187.0
Turbadium bronze	35,000	70,000	17.0	154	104.0
Turbine metal**	40,000	80,000	20.0	166	80.2

Note: Tests conducted by double weir method (Mousson). * Cavitation erosion loss using fresh water, mm^3 in 16 hours. ** 3% Ni, 1% Al, 2% Mn.

composition approaching that shown in Table VI. Subsequent work on cavitation erosion by Kerr[5] and Mousson[6] indicated the superiority of these nickel-alloyed manganese bronzes over their unalloyed companions.

The tests conducted by Mousson (Table VII) showed that Turbadium bronze was 1½ times more resistant to cavitation erosion than ordinary manganese bronze free from nickel, while Turbine Metal, an alloy composed of 3 per cent nickel, 1 per cent aluminum, 1 per cent iron, 2 per cent manganese, 36 per cent zinc, and the balance copper, was 2½ times as resistant as the usual alloys used for marine propellers.

Cavitation and Erosion Fatigue—More recently, the Naval Engineering Experiment Station at Annapolis arranged a series of tests to evaluate the conventional and suggested alloys for use as marine propeller materials. Results of these tests were presented at the June, 1946 meeting of the ASTM. The damage to materials of the manganese bronze type appears in Tables VIII and X. Salt water corrosion tests were made in quiescent but constantly changing brackish Severn River water which was maintained at 80 ± 5°F (24 – 30°C). The specimens were ¾-inch rounds, 3 inches long, partially suspended in water for 515 days.

The severest corrosion for several alloys occurred at or above the water line. Corrosion below the water line was, in general, of the same type, but proceeded at a much slower rate. The type of corrosion which developed is described in Table VIII. Salt water corrosion fatigue tests, using White-Souther rotating cantilever machines, were made in the same investigation. Severn River water, which contains 1/6 — 1/3 the salinity of sea water, depending on the season and the tide, was used as the corrosive. Using a manganese bronze (OY) as a standard, relative values were determined. These are recorded in Table VIII.

At about the same time, vibratory hydraulic cavitation tests were made at Massachusetts Institute of Technology in sea water from Boston Harbor to determine the relative resistance of these materials to cavitation damage. The apparatus employed the magneto-striction of a nickel tube, vibrated at 6500 cycles per minute to provide the oscillations necessary to produce cavitation. The relative resistance of the materials compared with standard manganese bronze (OY) is shown in Table VIII. Tables VII and VIII clearly indicate advantages which nickel additions up to 3 per cent confer upon the manganese bronzes. The results apply (*Please turn to page* 226)

The author directs attention to the metallographic and physical characteristics of tellurium-graphite additions to a normal chilled iron. Micrographs are presented showing the structural differences at various levels below the chilled face of commercially made car wheels and the changes in chill depth of test blocks caused by variations in amounts of the combined additions

Structurespe

Chil

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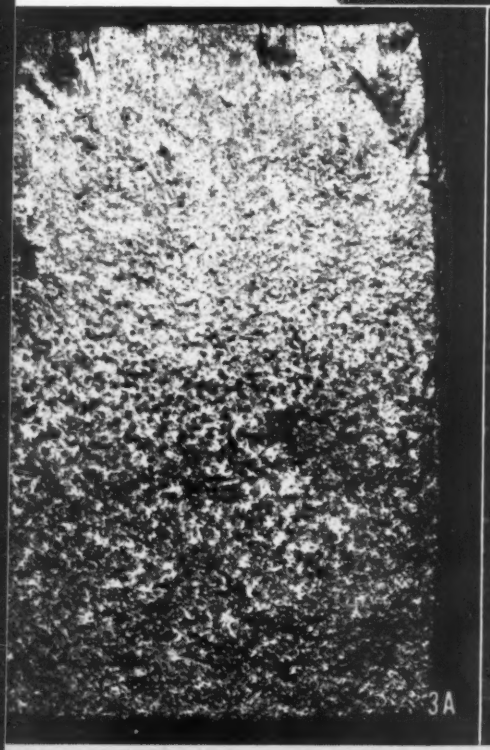
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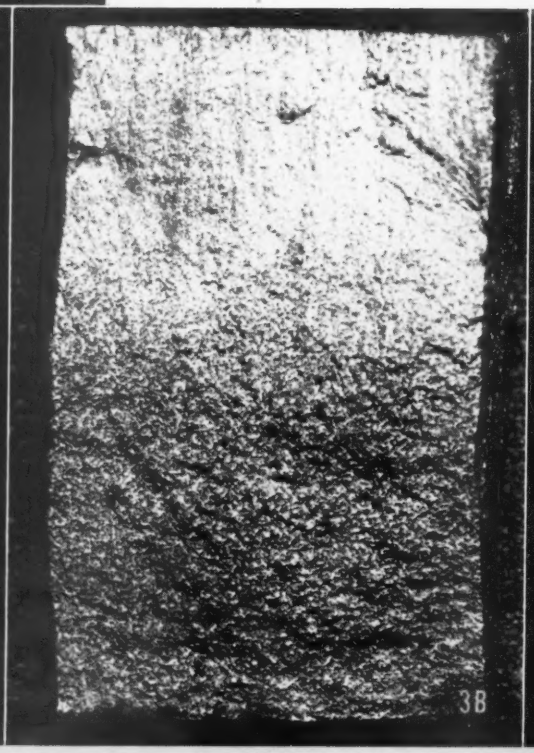
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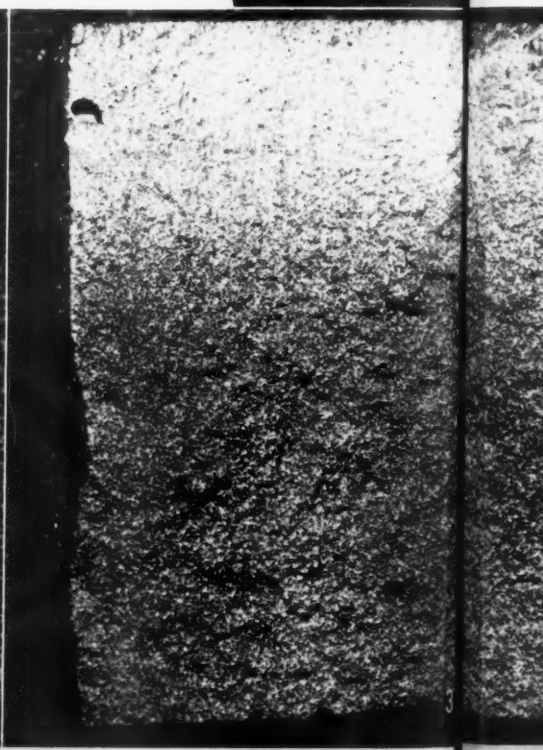
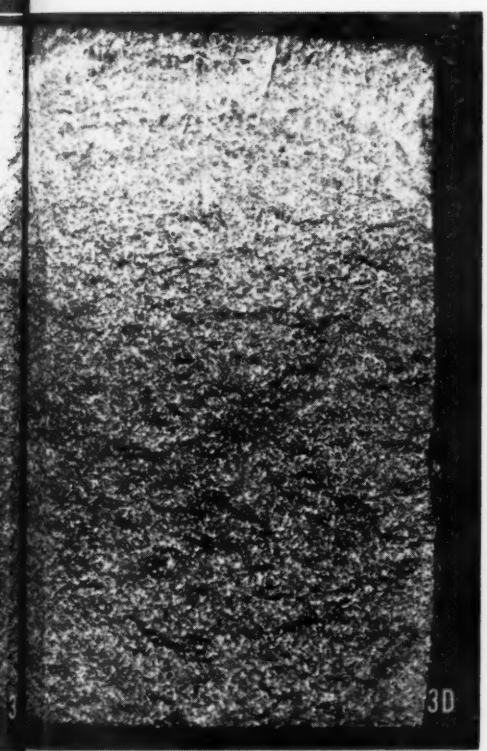

3

Position	*A*	*B*	*C*
½-in.	601 Bhn	517 Bhn	495 Bhn
1-in.	555	425	415
1½-in.	495	265	255
2-in.	415	243	229
2½-in.	375	238	229

Fig. 3—Effect of increasing graphite addition on chill depth in test block fractures, and brinell hardness at ½-in. intervals below the chilled surface. *A*—Base iron with 6 g tellurium. *B*—6 g tellurium +5 oz graphite. *C*—6 g tellurium +8 oz graphite. *D*—6 g tellurium +16 oz graphite. All views X1.5

rospects of Tellurium and Graphite Additions for Control in Cast Iron

Figs. 1, 2—Car wheel fractures of iron analyzing 3.50% total carbon, 0.50% silicon. X0.8. Fig. 1 inoculated with 3 g tellurium +2 oz graphite. Fig. 2 inoculated with 4 oz 90% ferrosilicon



D
477 Bhn
401
255
229
229

THE ADDITION of tellurium and graphite in balanced proportions to a normal chilled iron composition produces a casting possessing a white iron, wear-resistant surface backed by a comparatively narrow zone of finely dispersed mottled iron. In the literature Massari[1,2] has shown this effect in chilled test blocks and car wheel fractures. Such visual observations have been the sole means of evaluating a desirable effect which has been used extensively by the chilled car wheel industry to produce a better product.

The purpose of this article is to direct attention to the metallographic and physical characteristics of this combined addition by presenting microscopic evidence of the structural differences at various levels below the chilled face of commercially-made car wheels and the changes in chill depth and hardness of test blocks with variations in the amounts of the combined addition. The technology has received relatively scant attention in the literature until the recent publication of two papers by Sumner[3] and Austin[4] dealing with the use of tellurium alone as a chill inducing medium.

The primary use of tellurium as an addition to cast iron is to promote the formation of a hard chilled iron either with or without the use of chill back. Thus it appears to function as a carbide forming element but the amount added is quite small, the chill effect is not dependent on the introduction of alloy carbides, and the chill may be restricted with a given depth of case. When combined with a graphite addition, the transition from white iron to gray iron is normally quite sharp compared to the mottled zone obtained with the usual carbide forming elements.

The mode of occurrence of tellurium in cast iron has been a source of speculation. Morrogh[5] has shown that in the presence of excess manganese in iron a light dove-gray phase, probably manganese telluride, is formed. Without manganese or with insufficient manganese to balance the sulphur an optical anisotropic phase is formed which he maintains is probably iron telluride. No doubt, when added to iron in larger amounts it forms a telluride but metallographic evidence of the phase is lacking in the very small amounts employed for the purpose of promoting a chill.

Briefly, tellurium is a transitional element classified in the sixth group of the periodic system with sulphur and selenium. It is a metal with an atomic weight of 127.6, a melting point of 846° F (452° C) and a boiling point of 2534° F (1390° C). Being a member of the same subgroup as sulphur and selenium, it exhibits similar chemical properties, yielding thus a tellurium hydride. It is the low volatilization point of the metal, together with the toxic properties of the effluent gas, which largely constitute the difficulties when used in cast iron with its somewhat higher furnace tapping temperatures. Consequently, delaying the effective reaction of the metal by employing it as a core wash or sand impregnation,[6] enclosing it in a thin copper or aluminum sheath,[3] or as a copper-tellurium alloy have been resorted to in order to alleviate the

problem somewhat. These expedients, together with the fact that the quantities are so small and readily oxidized, have led Austin[4], to the conclusion that tellurium does not function as a simple, true alloying element.

Tellurium has a hexagonal crystal structure similar to graphite. The latter has been demonstrated as an effective graphitizer or chill reducing medium by the work of Massari[1] and Lindsay[2]. Graphite exerts a pronounced influence on the depth of chill produced in a given casting and is almost as effective in this respect as silicon. Comparatively small quantities of amorphous graphite, added to the ladle just prior to filling, will substantially reduce the depth of chill in the resulting casting. Thus, the combination of tellurium-graphite in balanced proportions, apparently operating at cross-purposes, produces a most efficient means of controlling chill. The effectiveness of this combination in the manufacture of chilled car wheels will now be considered.

Materials and Methods — Most chilled car wheels have an outside diameter of 33 in. and weigh 700-850 lb. The flange is cast against a metal chill in the mold. Usually, a minimum clear chill of ⅜-in. is desired but it may run about ½-in. minimum to give a ⅛-in. safety factor. From there, the chill may vary to possibly 1 in. of clear chill. As narrow a mottled zone as possible with tough gray iron at the web and hub of the wheel are other requirements. Typical brinell hardness numbers are 550 for the clear chill, about 225 at the rim area, and 200 at the most massive area in the cross section. Impact values vary from 15 ft lb at the chill to 45 ft lb for the core, these values being obtained from 1-in. square blocks. Tensile strengths vary from 30,000 to 32,000 psi.

Chemical analysis specifications of most chilled car wheel manufacturers are: 3.40 to 3.60 per cent total carbon, 0.50 to 0.60 per cent silicon, 0.55 to 0.65 per cent manganese, 0.12 per cent max sulphur (0.10 per cent sulphur preferred) and 0.35 per cent phosphorus (0.30 per cent phosphorus preferred). The industry normally operates from remelt only, the charge consisting entirely of old wheels which are sold back on an exchange basis to producers. However, on occasions, charges employing small amounts of low-silicon pig and steel have been melted. Upon tapping from the cupola or other melting unit, 3 g of tellurium in tablet form, plus No. 8 graphite in amounts of 1 to 3 oz, as the depth of the chill requires, are added to each 750-850 lb of iron (which is the usual amount needed to cast one wheel). Since the transfer ladle to which the additions are made usually holds enough metal to cast two wheels at a time, double the amount, or 6 g of tellurium plus 2 to 7 oz of graphite, are added to each ladle.

To reveal the chilling tendency in such iron, two general methods can be used. First, the car wheel fracture will show the influence of any element on the chilling tendency and will provide a cross section for the measurement of the overall chill. One illustration of this for tellurium-graphite inoculation has been shown in the literature by Massari and Lindsay[2]. Secondly, a study of the microstructure of chilled iron at various levels below the chilled surface can be employed as a means of predicting the probable physical properties. This test is more sensitive in that it will provide quantitative evidence of the type of chill existing at the surface and the extent of the mottled zone between the chilled surface and the gray iron interior.

Thus it becomes apparent that improvement in the properties of chilled iron entails the modification and coincident improvement of not one but three different microstructures within the same casting, and that the use of any inoculant must be directed so as to modify beneficially the entire microstructure simultaneously and not one to the detriment of the others. Both of these methods will now be discussed and emphasis placed on the latter as a means of illustrating the beneficial effect of tellurium-graphite addition.

To study the effect on the depth and character of the chill in standard 33-in. diameter car wheels, a number of such wheels were secured during part of a day's commercial production. Some wheels were inoculated with 3 g tellurium + 2 oz graphite and others were inoculated with 4 oz of 90 per cent ferrosilicon for comparison purposes. Care was taken to insure that the pouring temperature into the molds was the same for both groups, a temperature of 2350° F being selected and measured by an immersion pyrometer placed in each ladle of iron. The iron was melted in a cupola and had an analysis of 3.50 per cent total carbon and 0.50 per cent silicon prior to inoculation. Representative wheel fractures were then photographed and samples cut from various positions below the chilled surface were polished metallographically. Some of those are shown in the accompanying illustrations.

Show Effect of Graphite Addition

To study the effect of variations in graphite addition on the depth and character of the chill in 1½ x 3 x 6-in. test blocks, a ladle of iron analyzing 3.45 per cent total carbon and 0.59 per cent silicon was treated with 6 g tellurium plus ¼ lb graphite, ½ lb graphite or 1 lb graphite per 1600 lb of metal. Chill test blocks, with the 3 x 6-in. face cast against a chiller and the remainder molded in core sand, were poured for each treatment at a temperature of 2350° F. These blocks were then fractured, photographed and then surface ground for brinell hardness measurements.

Metallography — Chilled car wheels, although poured from molten metal having a uniform composition in the as-cast condition, contain metal of widely divergent combined and graphitic carbon content and hardness. When a casting is poured against a chiller, the contact surface is first to solidify, then the metal immediately under it, namely, the mottled zone, and finally the gray iron interior. Differences in the rate of solidification result in the carbon being in the combined state as iron carbide in the chill proper, some graphitic or free carbon along with carbide in the mottled zone, and a great preponderance of graphitic carbon over combined carbon in the gray iron interior.

Thus, for any given iron composition there is a critical cooling or solidification rate which must be exceeded if a hard, white fracture is to be produced. Rates of cooling slower than this critical rate will produce an iron with a gray (*Continued on page* 212)

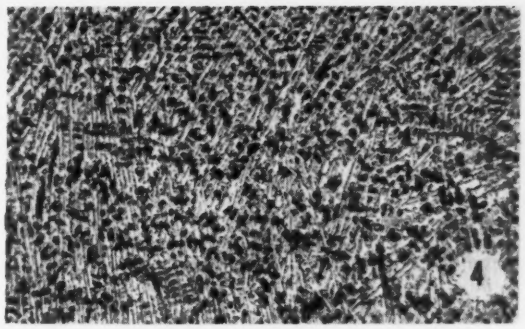


Fig. 4—Representative structure at the chill surface in a tellurium-graphite treated car wheel. Nital etch. X50

Fig. 5—Nature of primary carbide structure in chill surface of a tellurium-graphite treated car wheel. Nital etch. X500

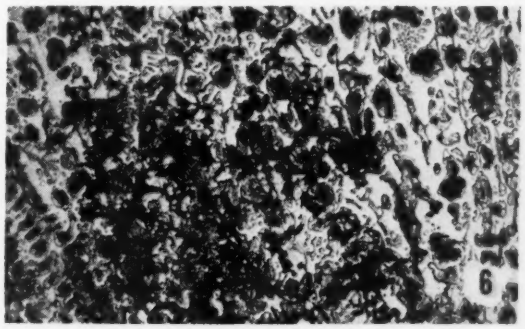


Fig. 6—Representative structure at beginning of mottled zone in tellurium-graphite treated car wheel. Nital etch. X50

Fig. 7—Representative structure at 2 in. below chill face of a tellurium-graphite treated car wheel. Nital etch. X50

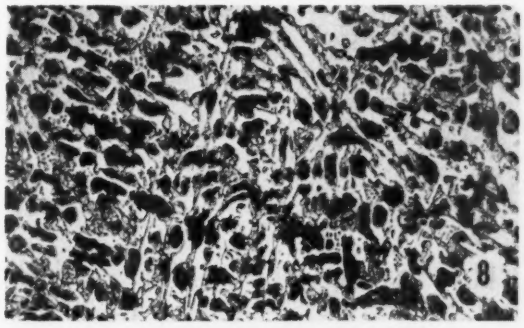


Fig. 8—Representative structure at chill surface in a car wheel treated with 90 per cent ferrosilicon. Nital etch. X50

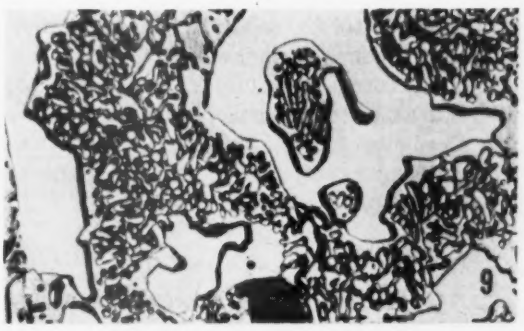


Fig. 9—Nature of primary carbide structure in chill surface of car wheel treated with 90 per cent ferrosilicon. Nital etch. X500

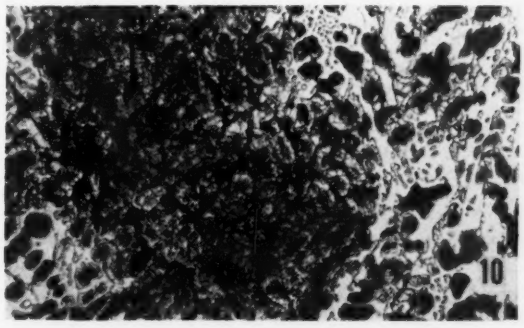


Fig. 10—Representative structure at the beginning of mottled zone in 90 per cent ferrosilicon treated car wheel. Nital etch. X50

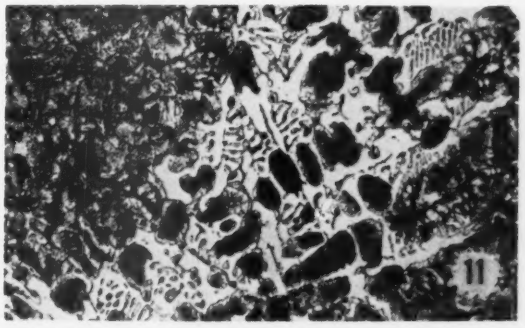


Fig. 11—Representative structure 2 in. below the chill face in a 90 per cent ferrosilicon treated car wheel. Nital etch. X50

QUESTIONS and

Determine Small Cupola Size

Q.—What is the smallest size cupola considered practical in the foundry? Will such a small cupola melt hot iron?

A.—Hot iron can be melted in any size cupola provided the cupola is operated properly. The latest small unit brought to our attention is 3-in. diam inside the lining. So far as practical operation on a commercial base is concerned, your question might be answered by the statement that the smallest unit made by a firm which builds cupolas has a 27 in. shell and a diameter of 18 in. inside the lining. A cupola this size has a melting capacity of approximately 1000 lb per hour. If this size and capacity meet your requirements, the shell will be about 12 ft high, if you propose to charge the material through a charging door.

A cupola 2 or 3 ft shorter will function satisfactorily where the material is charged directly into the open top. Tuyere openings for a small cupola may vary to a considerable extent, but the usual proportion is one-eighth the cupola cross-sectional area. The tuyeres may form a continuous opening, or they may be four to six separate units. Either arrangement will serve satisfactorily. Iron can be melted in many forms of crude and home-made melting units, but as a general rule the best policy is to purchase a cupola from a reputable manufacturer who has had long experience in designing and building them for maximum efficiency.

Making Malleable Iron Castings

Q.—We would like to obtain technical information about the production of malleable iron castings. Can you give us the names of good books or other literature on this subject?

A.—Production of malleable iron involves use of a base iron which in the as-cast state shows a completely white fracture. That material then is heat treated or annealed; first at high temperature to bring all the carbon into solution, and then slowly cooled so that the carbon precipitates in the well known "temper" or nodular form in a matrix of ferrite.

Iron for the malleable process may be melted in powdered coal-fired, batch type reverberatory (air) furnaces, electric furnaces, cupolas, or in combinations of cupola-air furnace or cupola-electric furnace. Iron melted only in the cupola does not possess as high physical properties as that melted in other units, and mainly is employed for pipe fittings. Castings are annealed in powdered coal-fired or electrically heated furnaces or ovens at temperatures of 1650 to 1750°F. Total annealing cycle may be from 60-72 hr to 7 days. The former, usually termed "short-cycle," requires exacting control of composition and annealing cycle.

General book on the subject, written essentially for engineers, designers and consumers of malleable iron castings, is *American Malleable Iron,* published by the Malleable Founders' Society. Others are *Gating and Heading Malleable Iron Castings, Graphitization of White Cast Iron, Malleable Foundry Sand and Core Practice,* and *Malleable Iron Melting.* Those four are symposiums which were presented at various meetings of the American Foundrymen's Society, and are available from the book department of FOUNDRY.

Troubled by Oxide Inclusions

Q.—We operate six gas-fired furnaces, and are having considerable trouble with oxides forming in the aluminum alloys we melt. Two of the furnaces are tilting type of 500-lb capacity, and four are holding type using No. 60 and 80 crucibles. We consulted our local gas utility, and they advised us that we are using an improper mixture of gas for melting aluminum, but could not tell us the proper mixture. Can you tell us?

A.—The only way you can determine whether or not proper combustion conditions are occurring in your furnaces is to employ Orsat or other apparatus to analyze the composition of the furnace atmosphere—that is, the quantities of carbon monoxide, carbon dioxide and oxygen present. You do not mention what kind of gas is being used, but theoretically natural gas requires about 9.5 cu ft of air per cu ft while manufactured gas needs about 4 cu ft. However, in practice excess air is required, and probably 1 cu ft should be added to those figures for perfect combustion conditions. It would be our opinion that if the burner flame is sharp and entirely blue, it should be about right. If it is reddish and ragged, too much air is being used, and if it is yellow or yellow tinged, the flame is reducing.

While it is possible that formation of oxide inclusions may arise from improper combustion conditions, we are inclined to think that it comes from some other source. First of all we would consider the temperatures at which melting and holding are conducted—assuming that the metal is melted in the tilting furnaces, transferred to the crucible furnaces and then poured. Melting down should be carried on at the lowest possible temperature which will fit satisfactorily into the subsequent operations of holding and pouring. Likewise the holding furnaces should be operated so that the temperature is just enough

nswers

above the pouring temperature and the metal reaches the pouring station at the proper temperature. Just what the various temperatures or rather temperature ranges will be is something that must be determined experimentally.

In that connection we suggest the following procedure: First, find the proper pouring range for the castings. Next, determine the temperature drop between holding furnace and mold side. Then in sequence find the time required to bring the metal from the melting furnaces up to temperature in the holding furnaces, and the temperature drop between the two types of furnaces. For example, assume that the proper pouring temperature is 1300°F, and the temperature drop between holding furnace and pouring station is 50°. This means that the metal in the holding furnace would have to be maintained at 1350°F. Next assume that it takes 15 minutes to raise the temperature of the metal in the holding furnace 125° which would mean that metal from the melting furnace could be at 1225°. However, there is a temperature drop of 25° between holding and melting furnace which indicates that the melting furnace temperature should be 1250°F.

Another consideration is the method of handling the molten metal. If it is poured at excessive heights from furnace to crucible, and crucible to mold, there will be a greater tendency toward oxide inclusions than when the distance is as short as possible. Excessive or careless stirring and skimming will increase oxide inclusions. If you are using outside, purchased scrap as part of your charges, look to that as a possible source of inclusions. Last but not least, you might investigate use of dry or gaseous fluxing of the metal in the melting furnace just before transferring to the holding furnaces.

Reclaiming Cast Iron Borings

Q.—Will you please advise us if you have any information regarding an economical and feasible method of reclaiming cast iron borings in the cupola?

A.—If your machine shop generates any considerable quantity of chips or borings daily, or the present quantity can be augmented by purchases from other machine shops in your vicinity, we believe that the most suitable procedure for reclaiming such material would be to install briquetting equipment. Such equipment compresses the borings into dense cylindrical briquets weighing from 3 to 11 lb which can withstand severe handling without breaking. Machines are available for making briquets at the rate of ¾ to 3½ tons per hour.

In the past, many methods of handling borings for melting in the cupola have been employed. They usually involved placing the borings in some type of container such as wood boxes, tin cans, or in lengths of common stove pipe. Attempts have been made to shovel the borings into the cupola, but the air blast usually blew the fine material out of the stack. A few years ago, Don J. Reese, mentioned that one foundry mixes 18 lb borings and turnings with 2 lb quick setting portland cement to form a briquet which was allowed to dry for three days before use.

Cast Cylinders in Green Sand

Q.—We make air brake equipment for railroad rolling stock in cast iron and aluminum. We have trouble with the cylinders leaking under air pressure after they are machined. In the final test they are washed in kerosene and air is blown through them. This is a hand operation. We are wondering if there is a simpler and more economical method for cleaning castings in American foundries. Molds for the cast-iron cylinders are made on a rollover-jolt machine with two identical half patterns on the plate. Molds for the aluminum castings are hand molded on the floor from a split pattern. All molds are poured in a horizontal position with a runner at one end and a riser at the other end. We shall appreciate your opinion of a proposed method for making two half cores with a sprue at the joint and a gate leading into the lower flange. The two half cores would be clamped together and tipped up to a vertical position to receive the metal.

A.—Taking your last question first, we do not think your proposed plan should be considered for two rea-

GANGWAY!

By J. A. PATTERSON

"Look, Miss, for your information, that is not an incinerator!!"

sons. (a) Making castings in cores is considerably more expensive than making them in green sand. (b) The changeover is not necessary. Wherever these castings are made in American foundries they are made in horizontal green sand molds. The cores also are green sand reinforced by a 3-in. diam perforated steel pipe and a few lateral members attached with wood wedges. Each end of the pipe rests in and is anchored tightly in a round hole in the end of the flask. Facing sand for mold and core contains approximately 6 per cent seacoal and the castings are fairly clean when shaken out. Small remaining traces of sand are removed in a tumbling barrel, under pressure blast, or under a device which throws metal abrasive centrifugally.

Under certain conditions your proposal to gate the casting at the bottom in a vertical core mold possesses some merit. It has no merit in the present instance because the method of gating the casting is a negligible factor. Any one of a wide variety of gates would serve satisfactorily. Any one of several items in the production chain might cause a resulting casting to leak. The principal and, in fact, the almost universal cause of dirty, leaking castings is a core which creates a disturbance in the metal. A green sand core may be rammed too hard or contain too much moisture. A dry sand core may contain too much bonding material and may lack sufficient gas exits. In either case the metal in contact boils more or less violently. Patches of sand are erupted from the surface and are trapped with the gas bubbles in the casting. Viewing your problem from this distance we are inclined to the opinion that the solution of your problem lies in improved coremaking practice.

Steel Bands on Snap Flask Work

Q.—We would like to obtain some information relative to the use of steel bands in making small shuttle eye castings. We are using tapered pop-off snap flasks with aluminum slip jackets with a 4° taper, and are contemplating use of a 1¼ x ⅛-in. rolled steel insertion to eliminate a shift. We understand that in inserting these steel bands they are placed in the cope and are suspended by four metal hangers attached to each corner of the flask. We also are wondering if some foundries are using this steel band in the drag although we believe that the band in that case would have a tendency to ride or fall to the bottom of the mold.

A.—Your information on the use of steel bands, or rather the method of holding them in place, is not quite correct. The steel bands are straight-sided and the measurements are such that they make a good fit inside the flask without need for holding devices. In operation the flask is placed joint-side up, and the band pushed in or partly in. Then the flask is turned over and set on the pattern which means that the band rests on the pattern board. Sand is rammed in position and will hold the band tightly in place—even on jolt-type molding machines. When the flask is unsnapped, the band is along the joint line. Such bands are used to keep sand from squeezing out after the flask is removed, or from pressure of molten metal poured into the cavity, and hence generally are used on the drag half since with snap flask work the casting cavity, or most of it, is in that portion. However, there is no reason why bands cannot be used in both drag and cope.

While use of a band will prevent so-called shifts resulting from the squeezing outward of the sand along the joint, it will not eliminate shifts caused by actual displacement of cope in relation to drag through a slight movement in carrying the closed mold from bench or machine to the area where the molds are set out. That type of shift will have to be corrected by closer attention to handling.

The First Casting in America

Q.—We have no reference library in this town, therefore I shall greatly appreciate your courtesy in supplying me with the following item of information. Where and when were the first gray iron castings made on the North American continent?

A.—The late Dr. Moldenke in his well known work, "Principles of Iron Founding," presented a comprehensive review of the iron industry in ancient and modern times and in various parts of the world. The following excerpts from the introductory historical chapter relate to your inquiry:

The first furnace actually built in America was located on the shore of Falling Creek 7 miles below Richmond, Va., in 1619. Indian troubles soon destroyed the enterprise. The actual location was discovered by finding the old slag piles.

The Saugus Iron Works undoubtedly were the first of the kind in the new world. It really was a Lynn institution. The briefest of Massachusetts legislative decrees says that "Saugust shall be called Linn." After the bog iron deposits in the upper Saugus meadows were discovered by Thomas Dexter in 1643, a Capt. Robert Bridges became interested and raised the necessary capital in London to develop them. A bloomery and forge were established and workmen imported from Hammersmith, England.

Joseph Jenks was in charge as master mechanic, and evidently also built a small blast furnace. The Essex East India Hall and the Essex Institute, both of Salem, also the Lynn Historical Society, claim to have castings made by him. Prejudice against the Saugus establishment on account of the rapid destruction of the forests for charcoal making caused much litigation and by 1688 the works had ceased to exist. Taunton claims the honor of having the first operating foundry, built in 1653 and still operating in 1860. Ore was taken from the South Precinct of Plympton, and charcoal from the neighboring forest. Sea shells furnished the lime. Power was developed by a water wheel.

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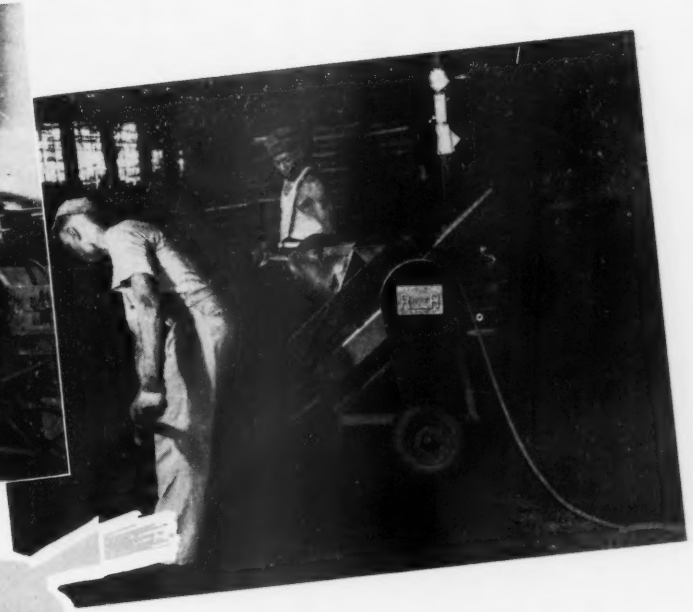

MALLEABLE IRON

Grey iron, malleable, steel, non-ferrous . . . whatever you pour you will get cleaner, smoother finished castings with Royer prepared molding sand. Blows, scabs and runouts are largely eliminated and machining and grinding time is greatly reduced.

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GREY IRON

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

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MEN
of Industry

P. R. UTZ, foundry superintendent, National Malleable & Steel Castings Co., Melrose Park, Ill., has been made assistant general superintendent in charge of the Malleable Division, Chicago Works. Mr. Utz was graduated from Rose Polytechnic Institute in 1932 and joined the company at its Indianapolis Works. He served in a number of supervisory positions there and in 1942 was transferred to Melrose Park where he had charge of the core room, later becoming assistant foundry superintendent and superintendent.

♦ ♦ ♦

F. B. Riggan, formerly general manager in charge of manufacturing, Key Co., East St. Louis, Ill., has been named vice president in charge of research and development. Mr. Riggan joined the company in 1938 and was previously chief metallurgist, foundry manager and general superintendent. **L. W. Matthey** who has served in various manufacturing functions of the company, has been named vice president-assistant general manager. All other officers and directors of the company were re-elected.

♦ ♦ ♦

C. V. Nass, vice president, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, and president, Foundry Equipment Manufacturers Association, was elected president of the National Castings Council at its annual meeting, Apr. 26, in Buffalo. Mr. Nass succeeds Edwin A. Horlebein, president, Gibson & Kirk Co., Baltimore. **A. V. Martens,** president, Pekin Foundry & Mfg. Co., Pekin, Ill., and president of the National Foundry Association, was elected vice president. **F. Ray Fleig,** president, Smith Facing & Supply Co., Cleveland, was re-elected treasurer, and **Frank G. Steinebach,** editor, FOUNDRY, was re-elected secretary.

I. W. Wilson has been named president, Aluminum Co. of America, Pittsburgh, succeeding **Roy A. Hunt,** president since 1928, who has become chairman of the executive committee. **Arthur V. Davis** continues as chairman of the board of directors and **Leon E. Hickman** has been named vice president-general counsel. Mr. Wilson, who joined the company in 1911, following graduation from Massachusetts Institute of Technology, became general superintendent of reduction plants in 1921, vice president in charge of operations in 1931 and since 1949 has been senior vice president.

♦ ♦ ♦

Thomas B. Parsons has been appointed manager of the permanent mold foundry, Aluminum Co. of America, Cleveland, succeeding **Warren Van R. Gilbert** who has been appointed chief of the Forging Section, Light Metals Division, NPA. Mr. Parsons, who has been works chief engineer for over 3 years, joined Alcoa in 1933. **Robert G. Hampel** has succeeded Mr. Parsons as works chief engineer. A graduate of University of Kansas, he joined the company in Cleveland 10 years ago.

♦ ♦ ♦

Carl E. Schultz has been named president, Benton Harbor Malleable Industries, Benton Harbor, Mich., following a reorganization of the company. **O. C. Schultz** has been made assistant to the president, **R. W. Wolfram,** sales manager, and **V. L. France,** general superintendent. **H. S. Gray** continues as secretary and **A. C. Sinnett** as treasurer.

♦ ♦ ♦

W. P. Snyder III has been elected president, Shenango-Penn Mold Co., Pittsburgh, succeeding **Harry S. Bradley,** who is retiring but will remain on the board, acting in an advisory capacity. Mr. Bradley founded the Penn Mold & Mfg. Co., Dover,

(*Continued on page* 136)

P. R. UTZ
. . . National Malleable supt.

F. B. RIGGAN
. . . vice pres., Key Co.

C. V. NASS
. . . Natl. Castings Council head

A. V. MARTENS
. . . vice pres., NCC

53 BLAST FURNACES LINED WITH NATIONAL CARBON,

TRADE-MARK

HAVE AVERAGED 1,000,000 TONS EACH

– *and still going strong!*

● National Carbon Company has now equipped 53 furnaces with carbon-block linings. 27 of these linings have produced over 1,000,000 tons of iron apiece at this writing. 10 of these linings have produced 1,500,000 tons. One lining has topped 1,900,000 tons. All linings are still going strong. We can think of no stronger proof of the value of "National" carbon for lining blast furnaces.

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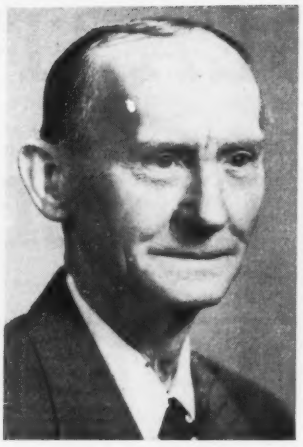
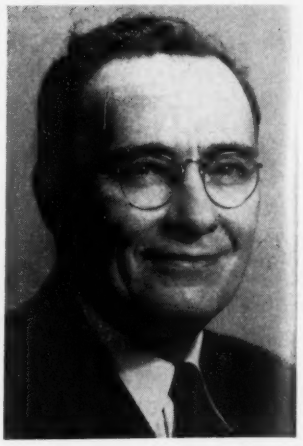
THOMAS KAVENY JR.
. . . NPA consultant

L. B. McKNIGHT
. . . exec. v. p., Chain Belt



JOHN NICKEL
. . . foundry supt. retires



HAROLD ROESCH
. . . Hamilton Foundry supt.

(*Continued from page* 134)

O., in 1916, which was acquired by the Shenango interests in 1927, when he became president. Mr. Snyder joined Shenango-Penn Mold in 1938 in Sharpsville, Pa., in the operating department of the blast furnaces and ingot mold foundries. He has been a vice president since 1946.

♦ ♦ ♦

Thomas Kaveny Jr., president, Herman Pneumatic Machine Co., Pittsburgh, has been appointed consultant, Foundry Equipment and Supplies Section, General Industrial Equipment Division, NPA, Washington. Mr. Kaveny, who has been associated with the Herman company since 1927, has been active in affairs of the Foundry Equipment Manufacturers Association, serving as its president in 1945 and 1946 successively. From 1943-44 he was chief of the Foundry Equipment and Supplies Section, Tools Division, War Production Board, Washington.

♦ ♦ ♦

L. B. McKnight has been elected executive vice president, Chain Belt Co., Milwaukee. Mr. McKnight joined the company in 1927 and has been a vice president and director since 1948. He is president of the National Association of Conveyor Equipment Manufacturers and is also a member of the Conveyor Industry Advisory Committee to the National Production Authority.

♦ ♦ ♦

John Nickel, since 1918 foundry superintendent, Hamilton Foundry & Machine Co., Hamilton, O., is retiring at the age of 70 to divide his time between his Hamilton home and his farm near Union City, Mich. Mr. Nickel is rounding out 51 years in the gray iron foundry industry. Beginning his molding apprenticeship at the turn of the century, he joined the then 13-year-old Hamilton company in 1904 as a journeyman bench molder. In 1907, when the company added an additional foundry building, he became foreman of the new unit, and in 1918 he was made superintendent of the rapidly growing company. **Harold Roesch,** who has been Mr. Nickel's assistant since 1925, will succeed him. After serving his apprenticeship in various foundries in the area, Mr. Roesch joined Hamilton in 1906. He became foundry foreman in 1918 at the time Mr. Nickel was made foundry superintendent, and in 1925 he was advanced to assistant foundry superintendent.

♦ ♦ ♦

Thomas A. Willson Jr. has been elected vice president, Willson Products Inc., Reading, Pa. Mr. Willson, who since 1947 has been assistant secretary of the company, will continue in that capacity.

THOMAS A. WILLSON JR.
. . . v. p., Willson Products

♦ ♦ ♦

Carlos H. Mercado has been appointed manager, foreign sales department, E. F. Houghton & Co., Philadelphia, succeeding L. J. Norris, who has retired because of ill health. Mr. Mercado, who attended Temple University and City College of New York, was formerly export manager-treasurer, Mercher Trading Corp., New York. **Charles R. Schmitt** has been named manager, lubrication sales department, with headquarters in Philadelphia. Mr. Schmitt, a graduate of Case Institute of Technology, joined Houghton in 1942 and has been lubrication manager for the Central and Western Division, in Cleveland.

♦ ♦ ♦

Raymond L. Collier has been appointed executive secretary of the recently organized National Association of Aluminum Distributors, with temporary headquarters at 905 Midland Bldg., Cleveland. Mr. Collier was executive vice president of the Gray Iron Founders' Society for four years and previously was associated for 18 years with the Steel Founders' Society of America.

♦ ♦ ♦

H. M. Bacon has been named vice president and general manager and **George Anselman,** vice president and general foundry superintendent, Beloit Foundry Co., Beloit, Wis. **H. F. Halverson** is president-treasurer and **Mrs. B. Kennedy,** secretary.

♦ ♦ ♦

Robert G. Faverty, since February managing director, Armstrong-Whitworth & Co., Pneumatic Tools Ltd., Newcastle-On-Tyne, England, new subsidiary of Independent Pneumatic Tool Co., Aurora, Ill., has been elected a vice president of the parent company there. Mr. Faverty, who has been in the company's sales division since 1929, managed the Chicago and more recently the Detroit branch offices. **John B. Dempsey,** who succeeds Mr. Faverty in Detroit, joined the company 12 years ago and has managed the Pittsburgh branch for 3 years. **Edward W. Krantz,** for the past 4 years manager in New York, succeeds Mr. Dempsey in Pittsburgh, where he spent 18 of

(*Continued on page* 139)

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For castings up to 50 tons. Outstanding hot strength; is thermoplastic. In green sand facing, prevents scabs, cuts, washes. Higher green strength than strongest fire clays, stronger than most similar binders.

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(*Continued from page* 136)

his 22 years company service. **William J. McGraw,** who has managed the Cleveland branch for 2 years, has succeeded Mr. Krantz in New York, where he began his service in 1946.

♦ ♦ ♦

Francis J. Buckley has been appointed to the Castings Section, Iron and Steel Division, National Production Authority. Mr. Buckley has had a broad background of experience in the foundry industry. From 1907 to 1942 he was associated with Federal Steel Foundry Co., and Penn Steel Castings Co., Chester, Pa., Marion Machine, Foundry & Supply Co., Marion, Ind., Salem Engineering Co., Salem, O., and Lombard Iron Works, Augusta, Ga. He was appointed to the Forging and Castings Section, Steel Division, WPB, where he remained 5 years, joining Lehigh Foundries Inc., Easton, Pa. in 1947. The following year he became part owner of Economy Engineering & Machine Works, Chester, Pa., which he assisted in operating until his NPA appointment.

♦ ♦ ♦

Robert D. Lawson has been appointed sales manager of the grinding machine division, Norton Co., Worcester, Mass., succeeding **C. Denson Day,** a Norton veteran of 25 years who has become vice president, Machinery Associates Inc., Philadelphia. Mr. Lawson joined the company's engineering department in 1918 and became Chicago district manager 5 years ago. **Wilfred R. Ogg,** formerly New England sales representative for the company's grinding machines, has succeeded Mr. Lawson in Chicago. He joined Norton Co. following graduation from Dartmouth College in 1935. **Louis J. Camarra,** who has been associated with the foreign division since 1946, including a year as sales representative in South America, has taken over the northern New England territory.

♦ ♦ ♦

Stanley F. Krzeszewski has been elected a vice president, American Wheelabrator & Equipment Corp., Mishawaka, Ind. He will continue as factory manager there, a position he has filled since he joined the company in 1945. Prior to that he spent many years in the foundry industry in positions ranging from foreman to plant manager. His technical education has been acquired through extension courses in engineering, foundry practice, accounting, industrial relations and management. Recently Mr. Krzeszewski was elected chairman of the Michiana Chapter of the American Foundrymen's Society for 1951-52.

♦ ♦ ♦

Clarence J. White Sr. has been appointed coreroom superintendent, Sterling Casting Corp., Bluffton, Ind. Mr. White, during 35 years in the foundry industry, has worked as coreroom foreman and superintendent at Champion Engineering Co., Kenton, O., Lima Locomotive Works, Lima, O., Fisher Brass Co., Bellefontaine, O., St. Marys Foundry Co., St. Marys, O., and Cooper-Bessemer Corp., Mt. Vernon, O.

♦ ♦ ♦

Harry J. Winters has organized his own company, Harry J. Winters Co., 1501 West Allegheny Ave., Philadelphia 32, representing manufacturers of core binders, paste, facings for steel and gray iron, sand insulators and plumbago for iron and nonferrous practice. Mr. Winters served 24 years as eastern sales repersentative, J. S. McCormick Co., Pittsburgh.

♦ ♦ ♦

Robert W. Wendt has joined Industrial Pattern Works, Chicago, as manager and sales engineer, succeeding the late E. W. Swiess. Mr. Wendt was formerly associated with Crane Co., Chicago, as supervisor of pattern layouts for brass, malleable, iron and gray iron where he co-ordinated foundry, engineering and pattern shop problems.

♦ ♦ ♦

William R. Wilkinson has been appointed vice president-sales, Johns-Manville Corp., New York, succeeding **L. M. Cassidy,** recently elected board chairman and chief executive office of the company.

♦ ♦ ♦

J. Henry Bruhn has been named superintendent of the Wilmington, Del., plant, Eastern Malleable Iron Co., Naugatuck, Conn., a new position in which he will be responsible for production and supervision of all lines of administration. Mr. Bruhn went to the company in 1947 from American Steel Foundries. **Stanley H. Gilbert** has been appointed superintendent of quality control and **Donald S. Ziegler,** manager of employee relations.

♦ ♦ ♦

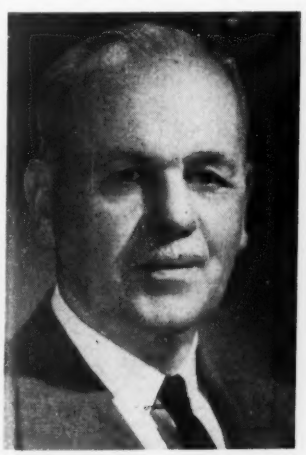
Dale D. Spoor, manager of the equipment sales department, Air Reduction Sales Co., New York, has been granted leave of absence to serve as chief of the welding section of the Machinery Division, National Production Authority, Washington.

♦ ♦ ♦

Stella R. Ellis has been advanced to chief chemist for Hunt-Spiller Mfg. Corp., Boston. Miss Ellis, a graduate of Boston University, joined the metallurgical department in 1943 as a laboratory technician.

♦ ♦ ♦

Dr. Clarence H. Lorig, assistant director, Battelle Memorial Institute, Columbus, O., recently received a distinguished service citation for accomplishments in the field of metallurgical engineering from University



FRANCIS J. BUCKLEY
. . . joins NPA castings group

ROBERT D. LAWSON
. . . Norton sales mgr.

WILFRED R. OGG
. . . Norton sales, Chicago

STANLEY F. KRZESZEWSKI
. . . V. P., American Wheelabrator

of Wisconsin at its third annual Engineer's Day. Dr. Lorig's undergraduate studies in mining and metallurgy at the university set the foundation for his long career in engineering and application of science to problems of industry. Last year he was awarded the Joseph S. Seaman Gold Medal for metallurgical research by the American Foundrymen's Society.

♦ ♦ ♦

Gordon F. Colson, formerly a grinding engineer in Norton Co.'s Worcester, Mass., office, has been appointed field engineer for the Abrasive Division, with headquarters in Chicago.

♦ ♦ ♦

William F. MacDonald has been elected president, E. F. Houghton & Co. of Canada Ltd., Toronto, Ont., succeeding the late G. W. Pressell. **E. H. MacInnis** continues as vice president and sales manager there.

Harry E. Lewis, until recently manager product development department,

HARRY E. LEWIS
. . . Great Lakes Carbon sales

Building Products Division, has been named general sales manager of the industrial sales department, Perlite Division, Great Lakes Carbon Corp., New York. Mr. Lewis, a graduate of Purdue University, previously was associated with Eagle-Picher Co., Cincinnati, Owens - Corning Fiberglas Corp., Toledo, O., and Carnegie-Illinois Steel Corp.

♦ ♦ ♦

Charles F. Scott has rejoined Hunt-Spiller Mfg. Corp., Boston, as supervisor of foundry production scheduling, following recent association with Boston Electro Steel Castings Inc., Boston. Mr. Scott first became associated with Hunt-Spiller in 1926. Previously he was with Chelmsford Iron Works, Lowell, Mass. **James F. Squarey** has been named materials control supervisor for the company, suceeding **Wallace B. MacGregor** who has resigned. **James C Crowley** has been appointed employment manager and **Calvin E. Ross,** storekeeper.

FEF ELECTS NEW OFFICERS AND TRUSTEES

JOHN M. PRICE, chairman, Ferro Machine & Foundry Co., Cleveland, was elected president of the Foundry Educational Foundation at its annual meeting in Buffalo, Apr. 26. He succeeds Claude B. Schneible, president, Claude B. Schneible Co., Detroit, who was elected chairman. Marion J. Allen, assistant to the president, American Steel Foundries, Chicago, was named vice president. Charles A. Barnett, president, Foundry Equipment Co., Cleveland, and George K. Dreher were re-elected secretary-treasurer and executive director, respectively.

Trustees selected to represent the FEF founding members are: Malleable Founders' Society — Anthony Haswell, president, Dayton Malleable Iron Co., Dayton, O.; Collins L. Carter, president, Albion Malleable Iron Co., Albion, Mich.

Gray Iron Founders' Society—W. R. Tanner, president, Zenith Foundry Co., West Allis, Wis., and Mr. Price.

American Foundrymen's Society—Garnett P. Phillips, general supervisor, Foundry Research, International Harvester Co., Chicago; Fred J. Walls, metallurgist, International Nickel Co., Detroit.

Foundry Equipment Manufacturers Association—Messrs. Schneible and Barnett.

Non-Ferrous Founders' Society — H. A. White, manager, Smeeth-Harwood Co., Chicago; Thomas H. Belfield, president, Cochrane Foundry Co., York, Pa.

Steel Founders' Society of America —Homer Tielke, vice president-general manager, Crucible Steel Casting Co., Cleveland, and Mr. Allen.

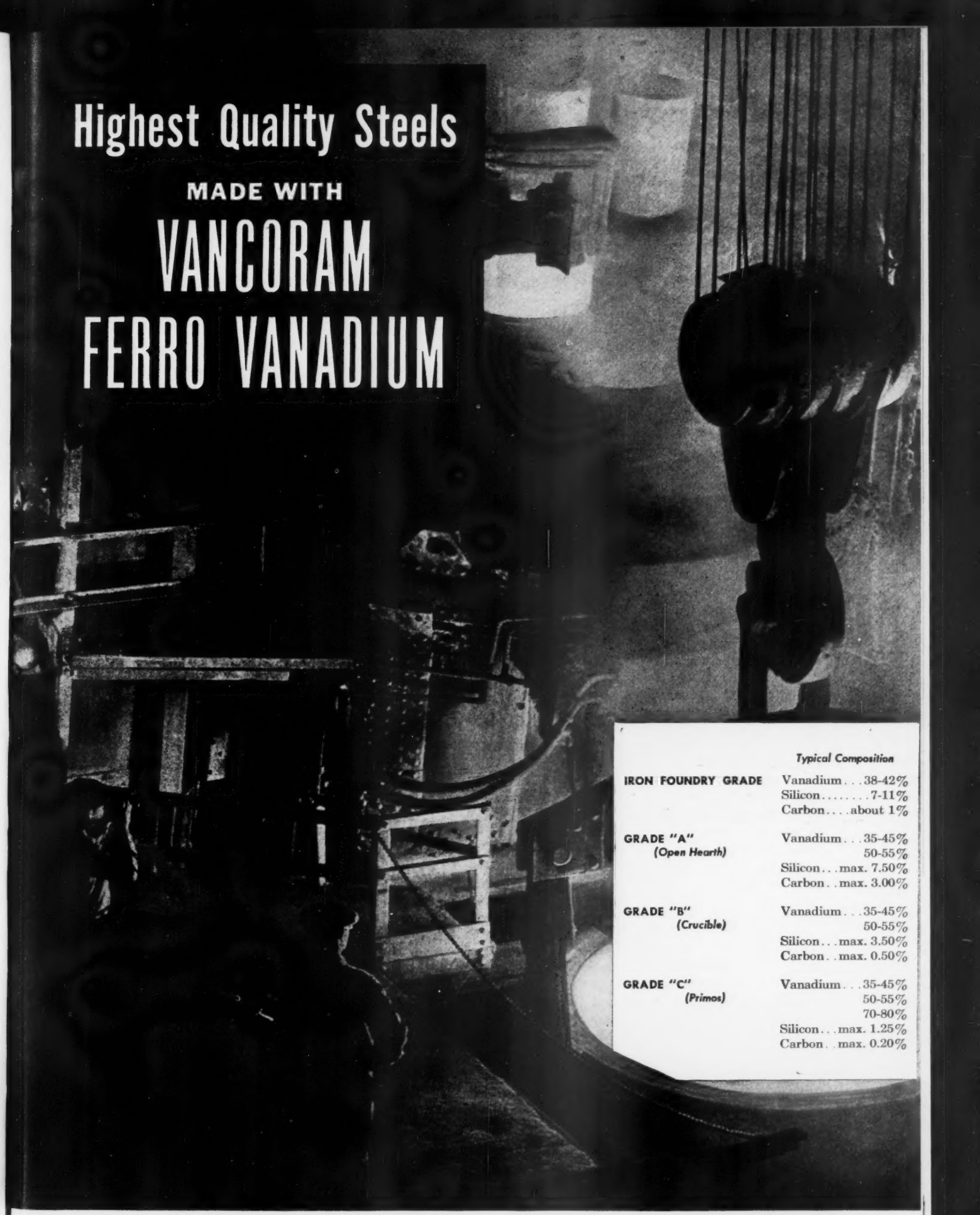
Trustees at large—James H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich.; Ben D. Claffey, president, Acme Aluminum Alloys, Dayton, O.; James T. MacKenzie, technical director, American Cast Iron Pipe Co., Birmingham; G. J. Behrendt, managing director, Eastern Malleable Iron Co., Naugatuck, Conn.; Frank C. Riecks, Ford Motor Co., Dearborn, Mich.; Stowell Wasson, manager, National Malleable & Steel Castings Co., Cicero, Ill.; Frank H. Bonnet, president, Buckeye Steel Castings Co., Columbus, O.; Edward C. Hoenicke, general manager, Foundry Division, Eaton Mfg. Co., Detroit; Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O.

JOHN M. PRICE
. . . President

MARION J. ALLEN
. . . Vice President

CHARLES A. BARNETT
. . . Secretary-treasurer

CLAUDE B. SCHNEIBLE
. . . Chairman



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IRON FOUNDRY GRADE	Vanadium . . . 38-42% Silicon . . . . . 7-11% Carbon . . . . about 1%
GRADE "A" *(Open Hearth)*	Vanadium . . . 35-45% 50-55% Silicon . . . max. 7.50% Carbon . . max. 3.00%
GRADE "B" *(Crucible)*	Vanadium . . . 35-45% 50-55% Silicon . . . max. 3.50% Carbon . . max. 0.50%
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CHEMICALS AND METALS

NEW AFS OFFICERS AND DIRECTORS

WALTER L. SEELBACH, president-elect of the American Foundrymen's Society, is president of Superior Foundry Inc., Cleveland. Mr. Seelbach was graduated from Case Institute of Technology in 1910 and has been associated with the foundry industry since that time, his first position being with the Forest City Foundries Co., Cleveland. He later became secretary-treasurer and vice president of that organization, resigning in 1946 to assume his present position with the Superior company. Mr. Seelbach was one of the organizers of the Gray Iron Institute, now the Gray Iron Founders' Society, and served that group as president.

* * *

I. Richards Wagner, vice president-elect of AFS, is a director and former president, Electric Steel Castings Co., Indianapolis. He joined the company in 1920 as metallurgist and chief inspector, was made superintendent in 1922, vice president and general manager in 1934 and later president. Mr. Wagner gained his early metallurgical experience with the Alan Wood Steel Co., Ivy Rock, Pa., and the Midvale Co., Phiadelphia. In 1918 he worked with the inspection division of the Ordnance Department and in 1919 transferred to the Watertown, Mass., arsenal as metallurgical chemist.

* * *

Walton L. Woody, vice president in charge of operations, National Malleable & Steel Castings Co., Cleveland, will continue to serve AFS for one year as a director. Mr. Woody has been associated with the National Malleable company since his graduation from Rose Polytechnic Institute in 1914, acting in his present capacity since 1943. He was first chairman of the Northeastern Ohio Chapter of AFS, served as a national director, vice president and is completing a term as president.

Albert L. Hunt, newly elected director, is works manager of the National Bearing Division, American Brake Shoe Co., St. Louis. Mr. Hunt is a native of St. Louis, was educated in its schools and was graduated from Washington University there. His first position was as draftsman for the Mississippi Valley Structural Steel Co., St. Louis in 1928, and he held similar positions subsequently with St. Louis Frog & Switch Co., and the city of St. Louis. Since joining National Bearing Division Mr. Hunt also served as machine shop superintendent, sales engineer and plant superintendent. He is a past chairman of the St. Louis District Chapter of AFS.

* * *

Dr. James T. MacKenzie, technical director, American Cast Iron Pipe Co., Birmingham, is a newly elected AFS director. A native Floridian and a graduate of the University of the South, 1912, he has been associated with ACIPCO since that time. For his achievement in experimental and research work both his alma mater and the University of Alabama have honored him with the degree of Doctor of Science. Dr. MacKenzie has served as chairman of the Birmingham District Chapter of the AFS, as chairman of AFS Gray Iron Division and of Committee A-3 on Cast Iron of the American Society for Testing Materials. He was the recipient of the AFS J. H. Whiting gold medal in 1937.

* * *

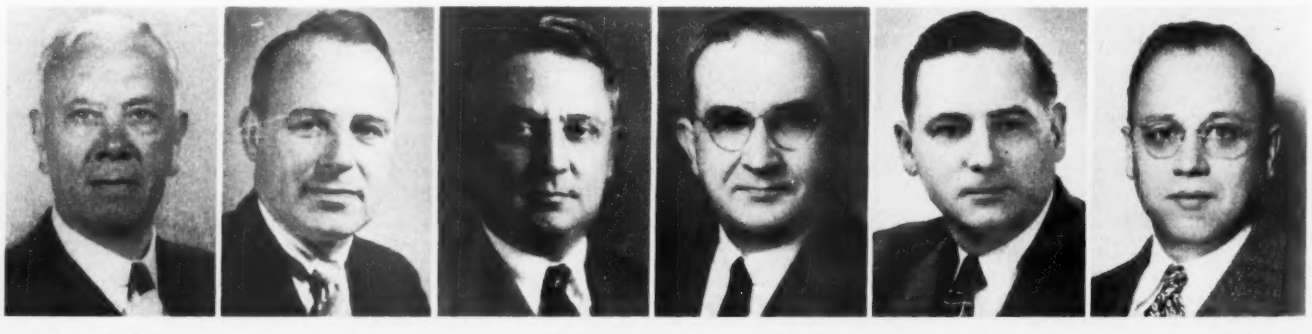
A. M. Ondreyco, plant manager, Vulcan Foundry Co., Oakland, Calif., and one of the organizers and a past president of Northern California Chapter of the AFS, has been elected a national director. Mr. Ondreyco trained in the foundry industry as a molder's apprentice, studied chemistry at Carnegie Institute of Technology and completed a special foundry apprenticeship at Westinghouse Air Brake Co., Wilmerding, Pa. He was operating metallurgist for that organization nine years before joining Meehanite Metal Corp. with whom he was a foundry engineer and metallurgist for five years. He later became assistant foundry superintendent at Cooper-Bessemer Corp., Grove City, Pa., leaving there to join the California organization.

* * *

Martin J. O'Brien Jr., works manager, Symington-Gould Corp., Depew, N. Y., who served one year on the board of directors of the AFS, has been elected to a full three-year term. Mr. O'Brien was first associated with the foundry industry as laboratory assistant with American Steel Foundries, East St. Louis, Ill., and later became an apprentice at its Granite City, Ill., plant. He resigned to join Symington-Gould and has served as assistant foreman, assistant superintendent, superintendent and assistant works manager prior to being named to his present position in 1949. Mr. O'Brien is a past chairman of Western New York Chapter of the AFS.

* * *

Harry W. Dietert, newly elected director of AFS, is president of Harry W. Dietert Co., Detroit. He was graduated from Iowa State College in 1920, for a time was instructor in charge of shops at Rice Institute, Houston, Tex., and in 1923 was awarded a master of science degree from the University of Illinois. He then became research engineer with U. S. Radiator Corp., Detroit, and later chief engineer. Mr. Dietert founded his company in 1925 and resigned from U. S. Radiator in 1936. Mr. Dietert has served almost continuously on the Sand Research Committee and Sand Division of the AFS and has played a prominent part in developing sand control methods for the foundry industry. He is a past chairman of the Detroit Chapter.



W. L. WOODY | A. L. HUNT | DR. J. T. MacKENZIE | A. M. ONDREYCO | M. J. O'BRIEN JR. | H. W. DIETERT

Here's the Improved No. 1 Model H *Semi-Portable* SIMPSON MIXER

- *ready to go the minute it arrives*
- *pull the switch and* **START MULLING!**

NOW smaller foundries can have *better* sand preparation at *lower* cost. With the Simpson No. 1 Model H Semi-Portable Mixer, top operating efficiency is combined with versatility in a medium-capacity unit.

Here is a mixer that is ideal for special as well as standard operations—in side floor, core room or general molding. For it incorporates the same controlled mulling principle found in larger Simpson Mixers. All types of sand and binder are more thoroughly blended for finer results and greater savings.

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Consult a National Engineer for more complete information, or write for Bulletin 491.

FEATURES

- Mulls all materials used in the foundry, including core sands, green and dry sand, facing and backing sands, and synthetic resin bonded sands.
- Easily handles 4 to 5 cu. ft. batches with 5 H.P. motor—no spillage.
- Fast—safe . . . mixer can be left unattended during mulling.
- Dust enclosure completely covers mixer. Can be loaded from any point.
- Two 300-lb. chilled car wheel iron mullers.
- Built-in, safe sand sampler.
- Semi-portable . . . easily handled by crane or lift.

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AROUND THE COUNTRY

DETROIT—Some officers at the Detroit Ordnance Tank-Automotive Center continue to express concern over difficulties in obtaining cast tank armor in tonnages sufficient to meet the need of the tank program. Other officials of the Center disagree with this thesis and indicate that cast armor production is satisfactory. Those indicating shortages state that while cast armor is favored for many applications, including turrets and hulls, it may be necessary to revise plans and specify rolled armor.

Gray iron foundries are beginning to see the advantages of defense work. There has been enough slowdown in consumer goods production to encourage active search for subcontracts. Reduced operations are necessary at die foundries, most of the auto body work for 1952 models having progressed to the die shops. There is no let-up, however, in foundry work from machine tool builders', whose order backlogs are greater than ever. For these foundries the scarcity of raw materials is a prime worry.

Reactive Dowagiac Foundry

After staving off substantial cuts for several months, automotive production has begun to slide, Ford and General Motors setting the industry-wide pattern. Kaiser-Frazer, whose part-conversion for defense work requires 35 per cent of Willow Run's floor space, was forced to close two weeks in May to rearrange facilities. K-F, incidentally, has reactivated its 343,000 sq ft gray iron foundry at Dowagiac, a facility which went out of production when it was found to be cheaper to buy engine castings than make them. The Dowagiac foundry will be used for production of parts for the Wright R-1300 aircraft engine to be built in the company's Detroit Engine Division. Another project of highly secret nature is reported to have spurred activation of the foundry.

Users are experiencing difficulty in obtaining miscellaneous castings because of the low profit margin for foundries. And there is within this area one sizable manufacturer of industrial machinery who is seeking to buy a foundry to assure his supply of cast components.

Defense Business Below Expectations at Chicago

Chicago—District foundries report slightly increased volume of DO business, but total still is below expectations. Raw materials supply is the No. 1 problem, as it has been for some time. Operations hold fairly steady, but only because of the excellent job suppliers are doing in keeping shipments of pig iron and coke well scheduled under their customer quota system. Inventories of both materials are very low. Adequate freight car supply is helping to keep deliveries on schedule.

Currently all 42 of the district's blast furnaces are operating, but production of foundry iron is limited by heavy requirements for steelmaking. Occasional offerings of foreign iron therefore are quickly taken up despite the premium prices. Manpower situation in general is fairly stable, although some skilled help is sought.

Good news to foundries in the Milwaukee area is the announcement of Milwaukee Solvay Coke Co., subsidiary of the Milwaukee Gas Light Co., that it is building 20 additional coke ovens. This will raise the company's total to 200 ovens. Completion is scheduled for next December.

Numerous castings for which subcontractors are sought were among the thousands of items displayed at the Air Force Prime Contractors Exhibit at Navy Pier, here, Apr. 30-May 9. The 10-day exhibit, tagged as "Operation Small Business," was sponsored by the Midcentral Air Procurement District, Air Materiel Command, Department of the Air Force, Chicago.

Subsidy on Imported Copper Ore Advocated

Cleveland—Some nonferrous foundrymen in this area are advocating government subsidy of imported copper ore to bring down the price and increase the supply of domestic scrap for foundry use.

Imported ore makes up the larger percentage of ore processed by smelters, and its price has skyrocketed in recent months, due to increased demand. Consequently, many smelters have sought scrap with which to produce copper-base alloy ingot to meet foundry needs. Scrap prices naturally jumped to the ceiling, and some of the more inexpensive grades have become extremely scarce. This has brought about a certain amount of upgrading and also some "bundled" sales (buy so much of this grade and you can have some of the grade that you want).

Because of the existing supply situation, smelters have been operating on scrap and ore inventories and attempting to apportion deliveries to foundries in an equitable manner. Now, however, inventories have about run out. Some relief is expected after July 1 when the Controlled Materials Plan will govern metals which foundries can purchase and supply.

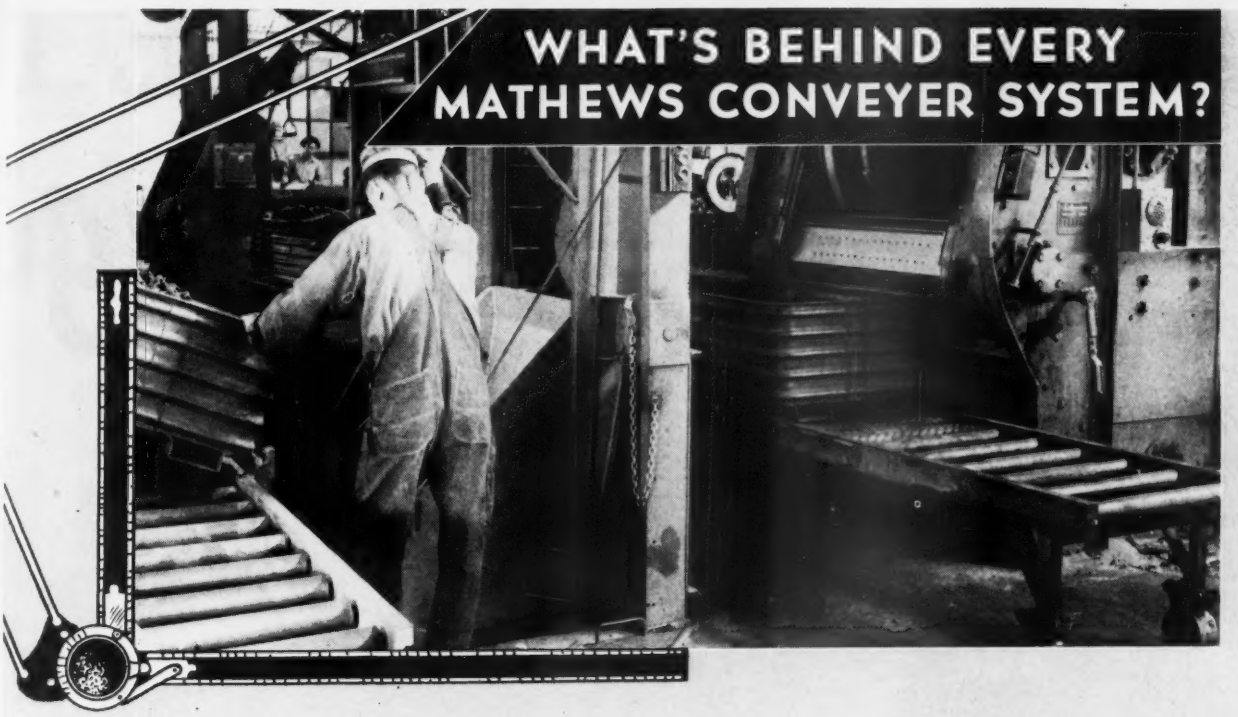
Need More Flexible Ruling

Advocates of government subsidizing of imported copper ore, however, fear that CMP may prove too rigid, strait-jacketing many foundries. They maintain that the subsidy would be more flexible, allowing a more normal conduct of business. The subsidy would lower the price of imported copper ore, thus diverting demand away from domestic scrap, with supply levels reaching a balance.

There are others, of course, who dislike subsidy plans of any kind. They have no other plan except the hope that government pricing regulations in formulation at the time of this writing will permit foundrymen to sell their castings at an economic price, considering the existing cost of ingot supplies.

General opinion seems to be that the new pricing regulation will permit foundries the same profit on their castings that was in effect during the immediate pre-Korea period. Casting prices can be increased only to the extent that metal and other raw materials and wages have increased since that time. No increased mark-up will be permitted. Furthermore, prices will have to be computed on a formula basis; no flat pricing, except by sensible weight and casting type classifica-

(*Concluded on page* 148)



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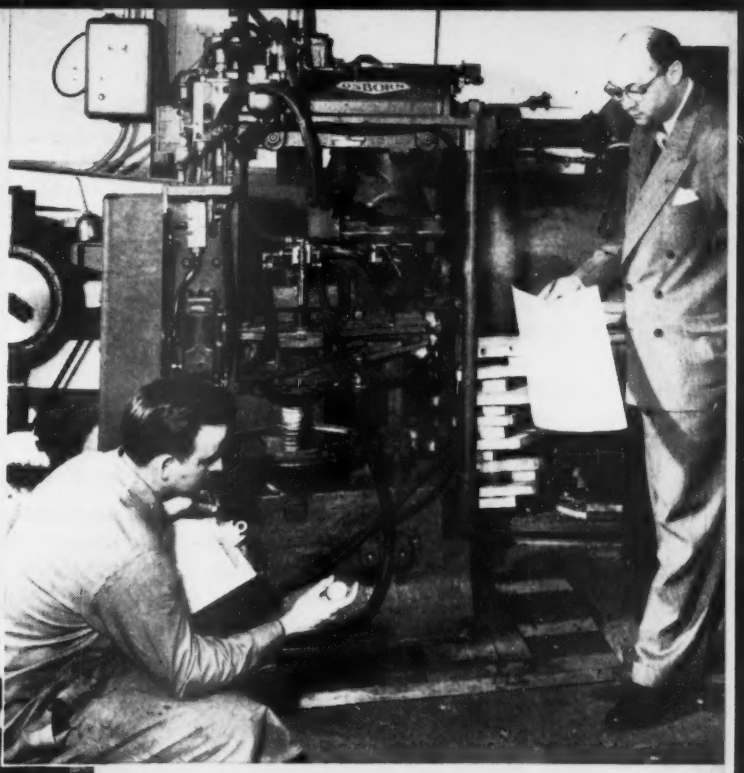

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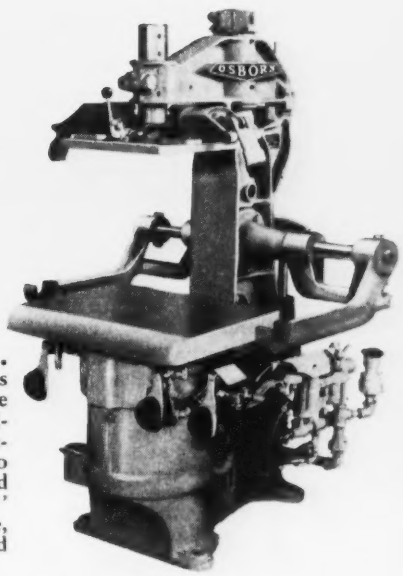

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(*Concluded from page* 144)

tion will be allowed. This latter point is viewed by most foundrymen as a good thing because it does away with an overall price-per-pound selling price for castings of various sizes and shapes. It achieves a goal at which industry leaders long have been aiming.

California Has Big Share Of Total Defense Orders

Los Angeles—District foundrymen's complaint that the Far West was receiving less defense business than the rest of the nation has been scotched by the Munitions Board. According to that agency, California led all other states in total prime contracts awarded from July 1, 1950 through Jan. 31, 1951. Of $8.9 billion in prime contracts awarded nationally, $1.6 billion or 18.1 per cent of the total went to California. Only New York, with 16.3 per cent of the total, received more than 10 per cent. However, local foundrymen point out that very few of the industries normally supplied by Far West foundries are DO rated.

Nonferrous foundries are getting more DO business than the ferrous because more of their customers are getting defense contracts. For example, the West coast aircraft industry, supplying 56 per cent of the nation's aircraft, has loaded aluminum foundries beyond capacity.

West Is Better Off

In the opinion of a prominent local foundryman, just returned from the east, West Coast foundries are better off in raw materials than eastern foundries. While shortage of pig iron has caused district iron foundries to reduce pig iron charge from 30-40 per cent to 15-20 per cent, cast scrap is in fair supply. Local scrap is very scarce but foundrymen, paying the freight, are successful in bringing in remote scrap from New Mexico, Arizona, and Utah. Some off-shore imports, mostly from the Pacific islands, are easing local shortages.

The pig iron situation is growing more acute. The only Far Western supplies of pig are from blast furnaces of Kaiser Steel Corp., at Fontana, Calif., and Geneva Steel Co., Geneva, Utah. All iron from these sources is required for steelmaking and none is available for outside sale. Consequently, district iron foundries must obtain pig iron from eastern or overwater sources. Supply of pig from the east has dried completely, and foreign imports are slowing. Formerly landed here from South Africa, Europe, and Chile, only Chilean pig, of poor quality, is still available. Coke is in short supply but eastern shipments have improved recently.

Nonferrous raw material supplies, particularly aluminum, are heavier. However, restrictions against production of copper and copper-alloy products as defined in NPA order M-12 has reduced activity of nonferrous foundries with low DO backlogs to 60 per cent capacity from the 85 per cent level reached before Korea.

Eastern Foundry Schedules Hit by Metallics Shortage

Philadelphia—Shortage of metallics, particularly pig iron but also scrap, is the major bottleneck in district ferrous foundry operation. Various gray iron foundries have been forced to reduce schedules from six to five days a week and in a few instances to four days. Some shops are using only 8 to 10 per cent pig iron in their mix, which not only is boosting their cost but is making for less satisfactory operations. Complicating things also is the increasing shortage of ferroalloys. Some sellers of silicon alloys, for instance, have nothing to offer for delivery under two to three months.

Malleable shops also are having special difficulty on this score. Pig iron not only is scarce but malleable scrap is almost nonexistent. Far less malleable is being reclaimed from freight cars than heretofore, especially now that most cars are built of steel. In the past with the wooden types, scrap malleable could be reclaimed much more easily by simply burning off the wooden sections of the car. Now the malleable has to be burned off by torch from the other metal sections, a more complicated procedure. Malleable producers, however, are able to keep going by considerable use of melting steel scrap and the necessary use of ferroalloys. Most district shops are operating two shifts five days a week, while one shop, engaged primarily in the production of pipe fittings, is actually working three shifts.

Steel foundries, working principally on castings for general machinery, railroads and heavy trucks, are operating five and a half to six days a week and in some cases have put on two full shifts. They are having raw material problems but to date have not had to curtail appreciably. General Steel Castings Co., Eddystone, Pa., is adding an annealing shop.

Because of metal shortage the nonferrous shops are confining business almost entirely to rated orders so as to assure replacements sooner or later. Much of their business is for government agencies. They are averaging five days a week and are experiencing, as their main problem, a shortage of skilled manpower.

ASTM To Hold Annual Meeting June 18-22

Annual meeting of the American Society for Testing Materials to be held at Atlantic City, N.J., June 18-22, has several sessions scheduled of interest to foundrymen. On Monday evening, June 18, a session on fatigue and nonferrous metals includes the report of Committee B-4 on Electrical Heating, Resistance and Related Alloys and a paper on "Fatigue Test in Axial Compression."

Tuesday morning a session on nonferrous metals will be held at which numerous reports will be presented. In the evening a session on fatigue will include a report of Committee E-9 on Fatigue and a paper "Influence of Surface Roughness on Fatigue Life and Scatter of Test Results on Two Steels."

A paper, "An Arbitration Bar Izod Impact Test for Cast Iron," will be presented at a session on fatigue Wednesday morning at 9:30 a.m. while at 11:30 a.m. a session on effect of temperature on metals will include reports of Committee A-1 on Steel and Committee A-3 on Cast Iron. The Marburg lecture on "Corrosion Testing" will be given by F. L. LaQue, International Nickel Co., at 4 p.m.

New Foundry Equipment Firm Organized

Foundry Services & Equipment Corp. has been incorporated in the state of Illinois to design and build foundry melting equipment and accessories and to provide foundry consulting and design engineering services. An affiliate, Air Purification Corp., will handle air, smoke and dust control equipment. Headquarters of the new organizations are at 16231 Turner Ave., Markham, Ill., with branch office at 1001 15th St., N. W., Washington 5. Officers are: President, Aubrey J. Grindle, formerly vice president and consulting engineer, Whiting Corp., and now on loan to the National Production Authority in Washington; vice president, J. H. Gougler, formerly design engineer of foundry equipment, Whiting Corp; secretary, M. L. Whetstone. Directors, in addition to Messrs. Grindle and Gougler, include Don J. Reese, Regner A. Ekstrom, Donald A. Moore, Robert L. Donahue and Herman Sietsema.

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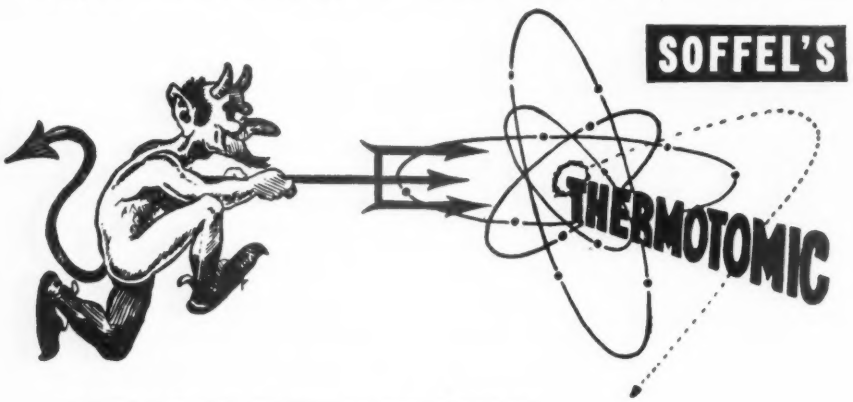

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EXOTHERMIC CARBON FREE LIQUIDIZER

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is the leader in major foundries for use on ferrous and nonferrous metals, and in ingot production. It is the first and the original scientific non-carbon exothermic compound for feeding heads and risers.

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is different from ordinary head compounds in two ways: It is CARBON FREE, thereby eliminating carbon pick-up. It is EXOTHERMIC. Carbonaceous materials, regardless of their composition, will cause carbon pick-up, segregation, non-uniform grain structure and hard spots under risers and in castings. Carbonaceous materials contribute no added heat value or increased temperatures to the feeding metal and only act as an insulating cover.

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER reacts within itself exothermically, producing a temperature above 3200° F. actually increasing the temperature of the feeding metal to a point well above that of the metal in the main body of the casting, thus ensuring that the feeding metal will be the last to freeze. Shrink cavities in the casting caused by premature freezing of the feeding metal are eliminated. After the exothermic action has ceased, the LIQUIDIZER forms a soft insulating blanket on the metal. This confines the heat generated by the LIQUIDIZER and aids in maintaining the desired high temperature of the feeding metal in the heads.

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TENTATIVE METHODS OF IMPACT TESTING OF CAST IRON

ASTM Designation: A 327—50T

1. These methods of impact testing cover the details of apparatus, test specimens, and procedure for gray cast iron and include three types of tests as follows:

Method A. Repeated-Blow Impact Test
Method B. Izod Type Impact Test
Method C. Charpy Type Impact Test

METHOD A. REPEATED-BLOW IMPACT TEST

Scope

2. This method covers the procedure for testing cast iron by the dropping of a hammer from increasing heights until the specimen fails.

Note.—The test is useful in comparing the relative toughness of cast iron under repeated impact. This test, as compared to the single blow tests of the Charpy and Izod types, which measure the total energy absorbed, measures the energy required to break the specimen after most of the plastic deformation has occurred.

Apparatus

3. (a) The test may be performed using a vertically dropping tup or with a pendulum type machine.

(b) A suitable apparatus, using a vertically dropping tup is shown in Fig. 1, together with the hammer. Suitable supports for the test specimens are shown in Fig. 2. The weight of the hammer will vary in accordance with the diameter of the bar being tested as indicated in Section 5 (b). It is important that the ratio of length of hammer to distance between guides be sufficient to prevent chatter in falling.

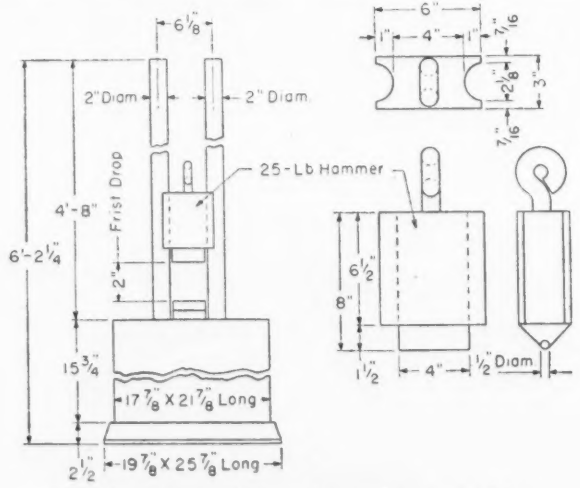
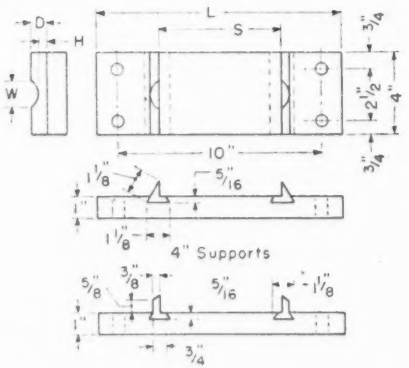


Fig. 1—Repeated-blow impact test machine

(c) The ordinary pendulum type Charpy machine may be used by clamping the specimen, as shown in Fig. 3, and releasing the pendulum from successive positions which give the equivalent inch pounds of energy corresponding to that of the falling hammer used for the apparatus with the vertically dropping tup.



Dimensions of Test Specimen Supports for Repeated-blow Impact

Bar	Span, in.	S, in.	W, in.	H, in.	D, in.	L, in.
A	4	4	0.875	0.38	0.63	12
B	6	6	1.25	0.63	1.13	12
C	12	12	2.13	0.75	1.25	16

Note: Supports to be made from SAE 4815 steel, carburized and hardened.

Fig. 2—Test specimen supports for repeated-blow impact test

Test Specimens

4. The test specimens shall have a plain cylindrical form and shall conform to the following dimensions:

Bar	Diam. in.	Length in.
A	0.875	5 to 7
B	1.20	7 to 9
C	2.00	13 to 15

Note.—These test specimens may be cut from the transverse or flexure test bars shown in Fig. 1 of the Standard Specifications for Gray Iron Castings (A. S. T. M. Designation: A 48).

Procedure

5. (a) The bar shall be held by a suitable clamping arrangement so that successive blows always strike the same spot, but not rigid enough to

TENTATIVE METHODS OF IMPACT TESTING OF CAST IRON

ASTM Designation: A 327—50T

affect the test. A suitable clamping device is shown in Fig. 4 (Note), or the bar may be held by the fingers.

Note.—When using this type of clamping device, the bar should be ground off on top and on both sides so the plungers will hold it in place.

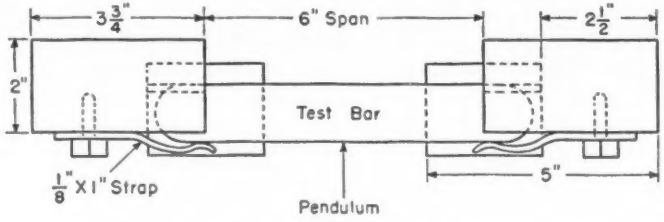


Fig. 3—Clamp to adapt Charpy impact machine for repeated-blow impact test

(b) The test span for the three types of bars and the weight of the hammer used shall be as follows:

Bar	Span, in.	Hammer Wgt. Lb
A	4	12.5
B	6	25.0
C	12	50.0

(c) The hammer shall be dropped first from a height of 2 in., next from 3 in., and so on by 1-in. increments until fracture occurs, the height of the last drop being recorded as the result of the test.

Corrections for Dimensions

6. Corrections for small deviations from standard diameter may be made on the basis of the relative areas of the cross-section of the bar tested and of the standard bar. Such corrections are of doubtful validity and bars should not be used which vary more than 5 per cent in area from the standard.

(to be concluded)

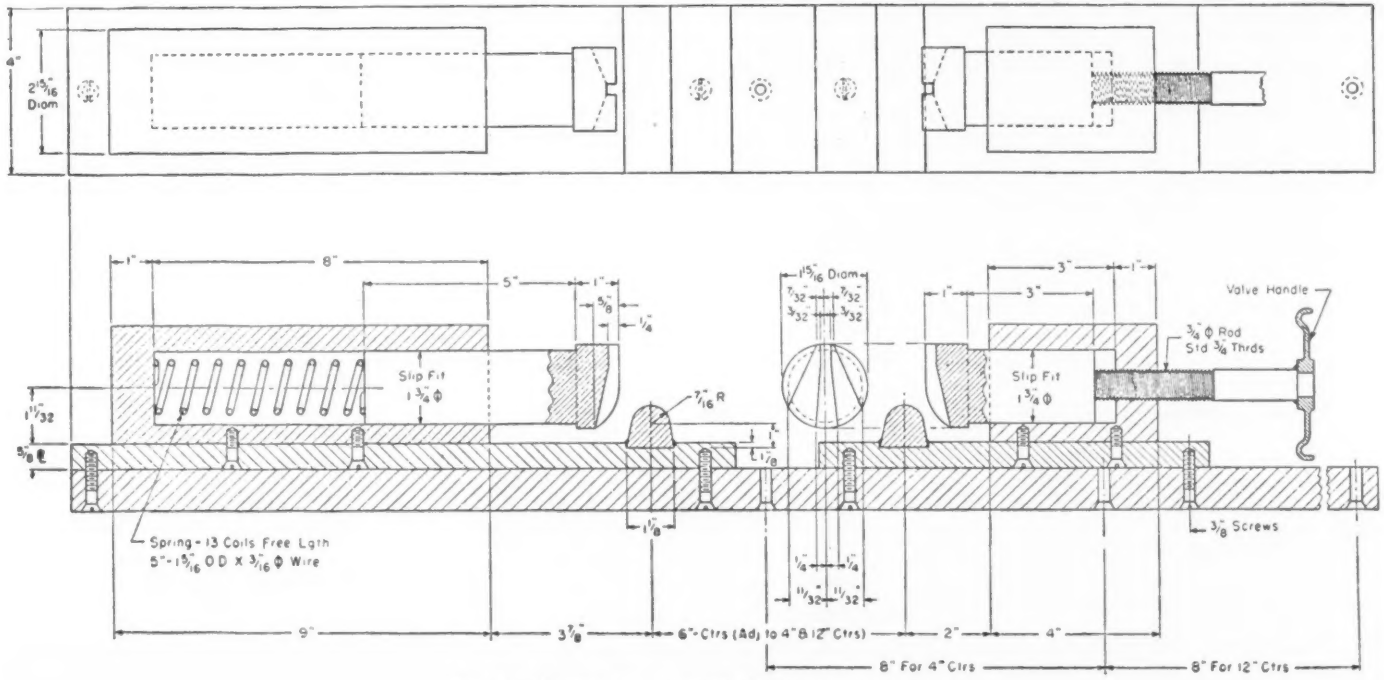


Fig. 4—Clamp for repeated-blow impact test

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AFS Convention Sessions

(*Continued from page* 105)

He discouraged the expenditure for research of a fixed percentage of a company's business volume, because research is most needed when sales are down. Despite the cost, it is a bigger risk to neglect research entirely than to adopt it. "To pioneer is to make mistakes. Not to pioneer is to risk failure," Mr. Zeder concluded.

In appreciation of his lecture, Mr. Zeder was presented a desk set by Gosta Vennerholm, Ford Motor Co., chairman of the Annual Lecture Committee.

Six prominent foundrymen selected by the AFS Board of Awards were presented gold medals and honorary life memberships at the dinner which climaxed the convention. Following the usual introduction of men seated at the speakers' table, Past President Ralph J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich., dwelt briefly on the subject of the gold medals and honorary life membership awards adopted many years ago by the society. Funds for the medals were donated by William H. McFadden, Ponca City, Okla.; Herbert Simpson, National Engineering Co., Chicago; John H. Whiting, Whiting Corp., Harvey, Ill.; Joseph S. Seaman, Pittsburgh; John A. Penton, founder of the Penton Publishing Co., Cleveland. The speaker was happy to direct attention to the fact that Mr. McFadden and Mr. Simpson, the only living donors, were seated directly in front of him and—as the audience's spontaneous applause subsided—very much alive indeed!

At the request of Mr. Teetor, C. H. Lorig, Battelle Memorial Institute, Columbus, O., presented the John H. Whiting medal to Alfred Boyles, United States Pipe & Foundry Co., Burlington, N. J., in recognition of "fundamental studies on the mechanism of graphitization of gray cast iron." A. E. Boegehold, General Motors Corp., Detroit, presented the John A. Penton medal to Victor A. Crosby, Climax Molybdenum Co., Detroit "for outstanding service to the AFS and his contributions to the dissemination of information relating to ferrous foundry metallurgy." Richard A. Flinn, American Brake Shoe Co., Mahwah, N. J., presented the Peter L. Simpson medal to Thomas W. Curry, Lynchburg Foundry Co., Lynchburg and Radford, Va., "for his outstanding work and contributions in the field of sand technology in the foundry industry."

A certificate of honorary life membership in the AFS was presented by V. J. Sedlon, Master Pattern Co., Cleveland, to Edward J. McAfee, Master patternmaker, Puget Sound Naval Shipyard, Bremerton, Wash., "In recognition of his outstanding service to the foundry industry in the development of patternmaking materials and applications." In the unavoidable absence of the recipient, E. W. Beach, the honorary life membership award presented by James Thomson, Continental Foundry & Machine Co., E. Chicago, Ind., was accepted by George W. Cannon, Muskegon, Mich. In accordance with the usual custom, Retiring President Walton L. Woody was presented with an honorary life membership award. In his reply Mr. Woody had pleasure in announcing the drive inaugurated a year ago for a fund of $100,000 to establish a permanent home for the society had met with success. To date the contributions have amounted to $127,000. He then introduced the speaker of the evening, Dr. Kenneth McFarland, superintendent of schools, Topeka, Kans.

The rapid-fire presentation of wit, humor, philosophy, shrewd and penetrating common sense defies condensation. The text, "Which knew not Joseph," he charitably assumed would be recognized as an excerpt from Exodus 1-8, "Now there uprose a new king over Egypt which knew not Joseph." Human nature never changes. The people forgot and the new rulers ignored and flouted the lessons of thrift and economy learned under the wise and benevolent rule of Joseph. The speaker quoted statistics to show how far succeeding administrations of the United States have departed from the principles, the habits and customs of the founding fathers. Unless the people call a halt on monumental waste and extravagance, the speaker warned, the country is headed for universal bankruptcy.

Large Attendance at Dinner

The annual Alumni dinner was held Wednesday evening with a fine representation from the past and present officers and directors, medalists and honorary life members. Edwin W. Horlebein, president, Gibson & Kirk Co., Baltimore, in his capacity as immediate past president of the society, presided for the introduction of all in attendance. Through the excellent arrangements by Charles Edgar Hoyt, Alumni Group secretary, the members were entertained with motion pictures of the 1951 Rose Bowl parade and football game, preceded by an interesting talk by Kenneth L. (Tug) Wilson, athletic commissioner for the Big Ten.

The Canadian dinner, which gradually has become a regular feature of AFS conventions, was attended this year by approximately 250 members and friends of the society from the north side of the international boundary line.

A thrilling and colorful touch this year was added by a kiltie band, waving tartans, skirling pipes, two-handed bass drum and the staccato rattle of the snare drums. The band made a triumphal entry through the main lobby of the hotel and then entertained the diners with musical selections, marching and dancing.

Chairman J. J. McFadyen, Galt Malleable Iron Co., Galt, Ont., and a national director, introduced retiring AFS President Walton L. Woody, and Walter L. Seelbach, president-elect. Others at the speakers' table included H. F. Scobie, AFS; A. F. Lewis, Eastern Canada Chapter; I. R. Wag-

(*Continued on page* 157)

W. H. Johnson, Naval Research Laboratory, speaking at the gating symposium

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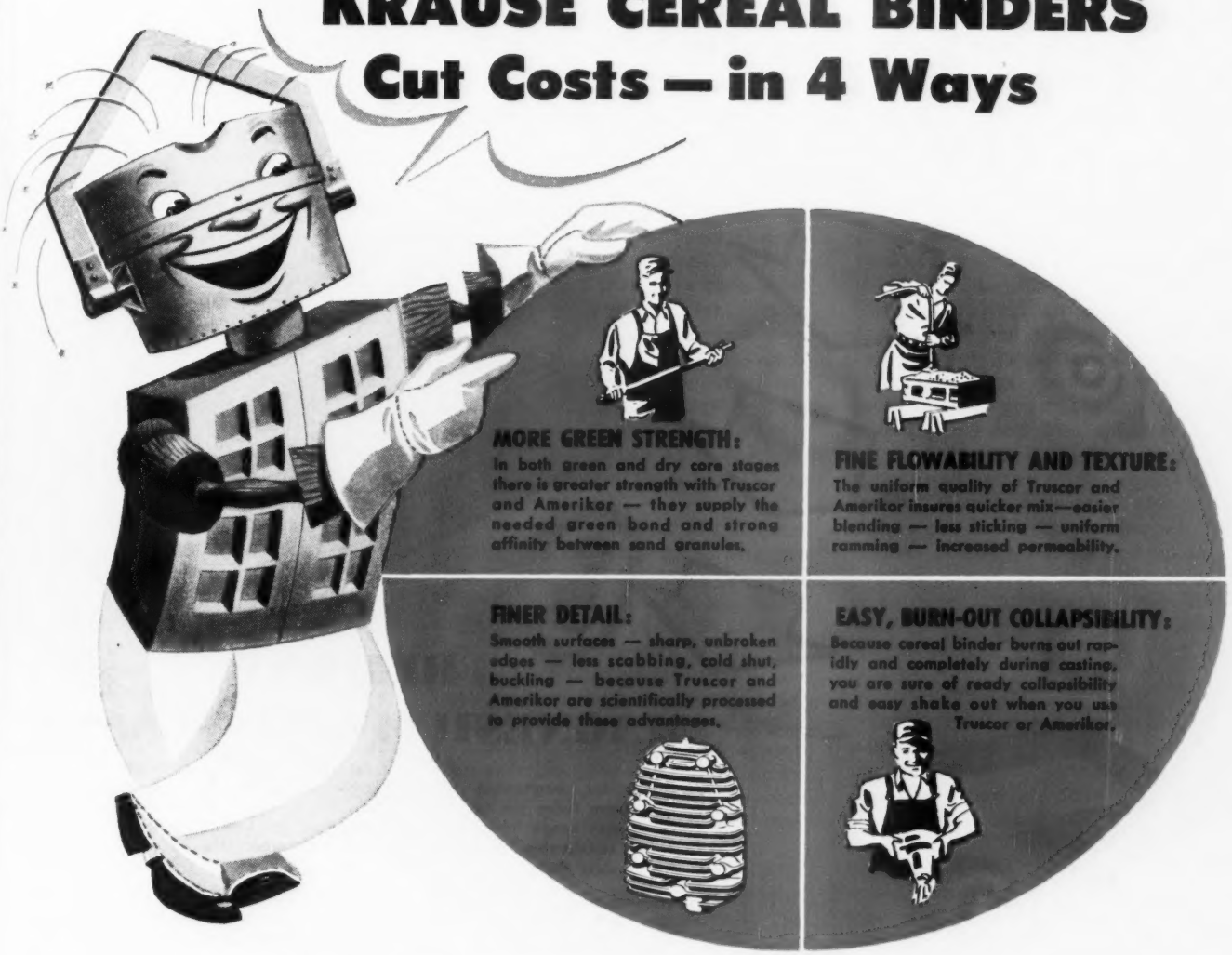

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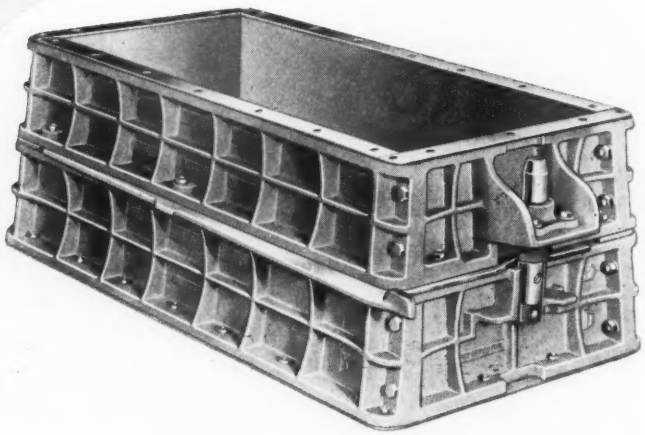
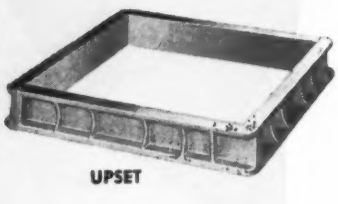


FREMONT
MAGNESIUM SLIP FLASKS



UPSET

are lighter, magnesium castings weighing 1/3 less than aluminum,—yet they have *twice* the tensile strength . . . the strength to withstand long, continuous usage in machine molding. Note the solid, bolted and welded corner construction, the steel faced top and bottom flanges. They're *really* heavy duty though ever so much easier to handle.

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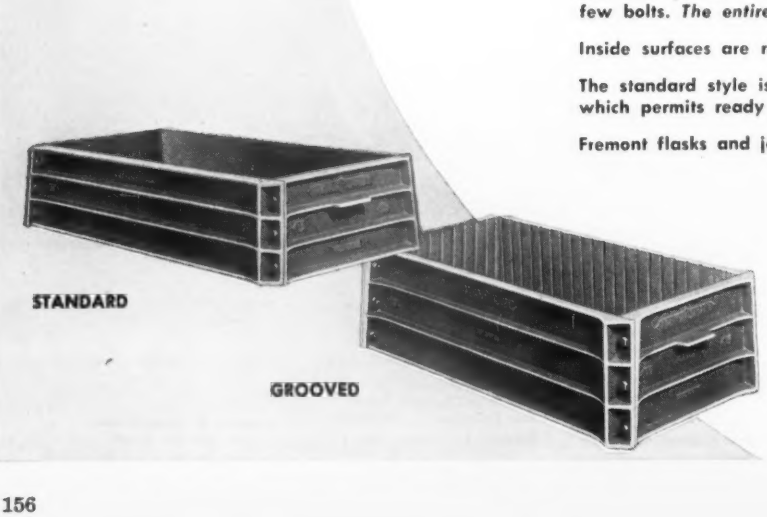

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(*Continued from page* 154)
ner, national vice president-elect; E. Delahunt, Warden King Ltd., Montreal; Joe Sully, former director, Toronto; G. L. White, Ontario Chapter; R. E. Kennedy, secretary emeritus AFS; and W. W. Maloney, secretary-treasurer.

SYMPOSIUM on GATING.....

FEATURED technical attraction of the convention was the Tuesday symposium on principles of gating. This symposium, comprising nine individual discussions at morning and afternoon sessions, was conducted before a capacity audience of approximately 1000. R. F. Thomson, Research Laboratories Division, General Motors Corp., Detroit, presided, assisted by representatives of the various AFS metals divisions. These included Walter E. Sicha, Aluminum Co. of America, Cleveland; W. S. Pellini, Naval Research Laboratory, Washington; George P. Halliwell, H. Kramer & Co., Chicago; Fred J. Walls, International Nickel Co., Detroit; and R. P. Schauss, Illinois Clay Products Co., Chicago, all of whom presided over individual portions of the program.

Discuss Tentative Designs

The first paper, discussing a tentative design of horizontal gating systems for light alloys, was presented by Dr. L. W. Eastwood, Battelle Memorial Institute, Columbus, O. Dr. Eastwood suggested measurements based on work done at Battelle under the Aluminum and Magnesium Division program for studying fluid flow of metals.

In this tentative design, a small tapered sprue with a top area several times that of the base is employed. It was pointed out that a common error is to make the sprue too large, preventing desired type of feeding. Section of the runner adjacent to the sprue base is widened to 2 to 2½ times the width of the sprue base to prevent air aspiration. The runner area is 4 to 6 times the area of the sprue base, and the cross-sectional area of the gates is equal to that of the runner area. Area of the runner is reduced by an amount equal to the area of the gate, as it is passed. The runner is streamlined and abrupt changes are avoided throughout the flow channel. In pouring, metal should enter the sprue as quickly as possible to prevent misruns and at the same time avoid using excessive temperature.

The second paper, "Relation of Casting Quality to Gating Practice," was presented by W. H. Johnson, Naval Research Laboratory, Washington. This paper was prepared by the speaker, H. F. Bishop and W. S. Pellini, also of NRL. Castings were made employing different types of choked and nonchoked gating systems. Molds were poured with steel, gray iron, aluminum, and manganese bronze. Most apparent defects in the castings resulting from the type of gating system used occurred in the case of the nonferrous metals when poured in a free system; choke control is needed for these metals. Mr. Johnson pointed out that while the choked system reduces metal oxidation, it increases sand erosion. Too great pressure is undesirable since it may damage the mold and produce excessive turbulence which will influence dross formation and gas absorption. It was also emphasized that no gating system is any better than the pouring practice employed.

In the period allotted to the Brass and Bronze Division, A. K. Higgins, metallurgist, Allis-Chalmers Mfg. Co., Milwaukee, contributed a discussion on "Considerations in the Feeding of Castings." The speaker stated that brass and bronze shops usually are small and do not have facilities for studying freezing of metal and heat distribution. The alloys cast depend upon specifications to be met. The investigation reported upon was concerned with evolution of gas during freezing.

Mr. Higgins emphasized that with brass and bronze, one is dealing with long-range freezing alloys. The metal passes from liquid to sponge to solid over a greater time interval, than ferrous metals, for example. Slow freezing promotes microscopic shrinkage, as compared with short-range metals, and this microporosity is the cause of leakage in castings.

There is a maximum length of feeder, the speaker declared, beyond which a casting will not be fed. It is necessary, therefore, to provide accelerated cooling or supplementary feeding to the casting.

In representing the Gray Iron Division, Prof. Howard F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass., presented an "Interim Report on Gray Iron Risering Research." A gray iron casting shrinks one day, the next day does not, and considerable work has been done to find out why. The answer still is lacking, due partly to the many variables involved.

The investigation sponsored by the AFS has embraced exhaustive search of the literature on solidification of metal and studies of castings for shrinkage. The latter revealed that some shrinks are external and some are internal and fit no definite pattern.

Within a short time, Prof. Taylor said, a third progress report will be issued. This will cover an investigation in which the runner system and feeding system were isolated. This leaves only the casting itself to be considered. Those pursuing the research are just now at the point where they know what the problem is.

The program involved the casting of 4-inch diameter spheres in molds made from green sand, dry sand and core sand to observe sand effect. The molds were poured through a small gate, then a plug was inserted to the sphere circumference. Some of the molds were rotated for 2 to 3 seconds after pouring and plugging, others were not. The spheres were cut in half and studied for location, extent and nature of the shrinks.

Prof. Taylor presented numerous slides to show his audience the shrinks obtained, but pointed out that cataloging and interpretation is yet to be done. It appears, however, that mold rotation had little or no effect on the shrinks.

Keep Gates Clean

Opening the second symposium session T. E. Kramer, Wm. F. Jobbins Inc., Aurora, Ill., presented several illustrated case histories of tall aluminum castings in which the gating system had to be changed many times before a successful technique was discovered and applied. Attention was directed to the fact that the objective of a satisfactory solution to the gating problem is the production of a sound casting by employing practical and commercially feasible methods. When considering gating systems it is necessary to include the gating, risering and chilling methods as a unit. The speaker explained that the subject had been discussed extensively in recent years. He suggested a study of many papers that had been published in various technical publications.

In discussing the subject from the steel foundry angle, J. B. Caine, foundry consultant, Wyoming, O., claimed that one important factor frequently was overlooked in gating discussions. The most perfect and scientific gating system will not produce good castings if the mold is not perfectly clean. Molders are careful to surround the pattern with perfectly blended facing sand, but dump any kind of old and sometimes rotten

sand around the gate sticks and riser blocks. In the speaker's opinion the practice is in the same classification as sweeping floor accumulations under the rug.

Discussion at the succeeding brass and bronze session, was led by B. N. Ames, New York Naval Shipyard, Brooklyn, and W. W. Edens, Badger Brass & Aluminum Foundry Co., Milwaukee. In addition to agreeing with the points raised by the other speakers, these speakers stressed the importance of melting and pouring nonferrous metals at a carefully controlled and definite temperature.

Fred G. Sefing, International Nickel Co., New York, presented a paper on "The Why of Gate and Feeder Design," at the concluding gray iron portion of the symposium.

Mr. Sefing stressed application of basic principles of gating and feeding, saying that their application would bring immediate improvement to castings produced in many foundries. Fundamental factors that make for sound castings, as outlined by the speaker, are: Get clean metal into the mold cavity, place gates and feeders and pour metal in such a manner as to obtain directional solidification of the casting, and get the metal into the mold cavity rapidly. In this latter respect Mr. Sefing said that castings weighing 100 to 2000 lb should be poured in 15-20 seconds.

Rapid pouring permits metal in the cavity to remain molten for a short period of time before solidification starts, thus allowing gas to get out.

During the discussion period H. H. Kessler, Sorbo-Mat Process Engineers, St. Louis, pointed out that the flow pattern of molten metal should be studied, particularly in light castings, because it affects temperature of the metal in the mold. He also presented tables showing pouring rates for various size castings and for calculating proper runner and sprue sizes.

"Trends in Malleable Gating and Risering" was the title of a paper given by Elmer C. Zirzow, Deere & Co., Moline, Ill., in the malleable iron division. Mr. Zirzow presented a commentary on a number of slides showing gating systems on patterns used for producing farm equipment items. Points emphasized were efficient gating systems wasting little metal and giving a high yield; employment of curved runners to get hot metal into every feeder bob, and the use of rounded junctions in all parts of the feeding system.

ALUMINUM and MAGNESIUM.....

FIRST of the aluminum and magnesium sessions featured two papers—"Melting Aluminum and Magnesium-base Alloys," by L. W. Eastwood, Battelle Memorial Institute, Columbus, O., and "Fluid Mechanics Applied to Founding," prepared by W. O. Wetmore and D. S. Richins, U. S. Naval Ordnance Test Station, Pasadena, Calif., and presented by Mr. Richins. J. J. Warga, Piasecki Helicopter Corp., was chairman with P. J. Scherbner, Sperry Gyroscope Corp., Great Neck, L. I., N. Y., as co-chairman.

In his paper, Dr. Eastwood stated that hydrogen is the major source of porosity in nonferrous melting and its solubility is lower in solid and molten aluminum than in magnesium. Avoidance of gases is simpler than their elimination from the melt. Dross, suspended in the melt, is a cause of hard spots in castings and its avoidance through good foundry practice is preferable to later removal attempts with flux materials.

Sources of hydrogen as listed by Dr. Eastwood are: Moisture in the air, combustion products, water adsorbed on the surface of charge materials, unclean and improperly dried tools, moisture in refractories, and water in fluxing materials, and from the mold.

Avoidance of gas absorption can be accomplished by preheating crucibles, tools and charge material; avoiding direct contact of metal with the flame during melting; use of dry fluxes; keeping maximum metal temerature and holding time of molten metal to a minimum; and by watching melt composition. High calcium, aluminum-silicon alloys are difficult to keep low in gas.

He concluded by discussing the purposes of fluxing operations. Salt fluxes are used as a cover and to separate dross constituents, preferably to obtain a dry dross. Gas fluxes assist in removing suspended dross particles from the melt; they also are used for degassing.

Dr. Eastwood stated that his presentation was intended as a supplement to the preprint of his talk which described types of melting equipment and charging and melting practices.

In his presentation, Mr. Richins dealt with the design of sprues and gating systems. He stated that basic, underlying principles of gating are applicable to all gating systems. He emphasized that most metals at normal pouring temperatures have about the same viscosity as water. In their work the authors showed that equations developed for gating system experiments with water are applicable to all metals.

The authors' experiments were conducted with aluminum alloys and tapered sprues were employed with controlled runner and gate sizes. Test castings were fed from the bottom with no steps in the sprue. The authors hold the opinion that stepped sprues create metal turbulence in the metal at each change of direction with increased possibility of carrying air and dirt into the casting.

Slides covering phases of the experimental work showed molds in which the casting cavity had been cut away to permit study of the metal stream emerging from the bottom of the sprue.

Study Centrifuging Methods

The aluminum and magnesium roundtable luncheon had R. F. Cramer, General Electric Co., Schenectady, N. Y., as chairman. A paper entitled "Centrifugal Casting," prepared by J. W. Meier and O. Z. Rylski, Department of Mines and Technical Surveys, Ottawa, Canada, was presented by Mr. Rylski.

The speaker pointed out that the work was confined to a study of centrifuging and did not cover true centrifugal casting. Purpose of the study was to develop designs for and to study applicability of various gating systems for centrifuging. Experiments were conducted with 356 aluminum alloy and AZ92 magnesium alloy. Dry sand molds covered with a mold wash worked satisfactorily; green sand work failed. Results indicated that the sand mixture and the mold wash must withstand high pressure and penetration, and that gating must conform to fluid mechanics principles and incorporate due consideration of centrifugal forces to feed the casting cavity properly. Furthermore, the castability of various alloys is important because centrifuging accentuates any difficulties inherent in this characteristic.

In conclusion Mr. Rylski stated that preferable centrifuging practice employs low initial rotational speeds with a rapid increase in revolutions per minute. Best test results were obtained with a starting speed of about 50 rpm with an acceleration in one minute to 750-800 rpm.

When questioned about laminated structure of centrifuged castings, Mr. Rylski stated that such structure re-

(*Continued on page* 161)

An Open Letter to....

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(*Continued from page* 158)

sults from turbulent entry of metal.

The concluding session, under the chairmanship of M. E. Brooks, Dow Chemical Co., Bay City, Mich., and co-chairmanship of W. D. Danks, Howard Foundry Co., Chicago, featured three papers. First of these, "Magnesium as a Die Casting Material," was presented by R. C. Cornell, Litemetal Diecast Inc., Jackson, Mich. Mr. Cornell outlined briefly the development of magnesium die casting since the early 1930's saying that the commonest alloy employed at present is AG91 and that most work is done in cold chamber machines. He forecast a trend toward use of hot chamber machines because of faster production speeds available.

Sulphur Dome Prevents Burning

Magnesium requires special handling during melting because of its tendency to burn. In his melting practice Mr. Cornell employs a sulphur dome over his furnace. This dome is self-generating and produces a protective sulphur dioxide atmosphere for the melt.

Fumes from melting fluxes employed are corrosive and open steelwork in the foundry building should have a protective coat of paint. Also, finished castings should be protected from fumes to avoid corrosion. Additional suggestions on melting pointed up the need for alloy additions, particularly aluminum, to remelts because of the loss of such alloys during melting. Zinc content of melts should be held to a minimum to avoid hot cracking.

Characteristics peculiar to magnesium which offer casting difficulties are its low latent heat with fluidity inferior to that of aluminum and its hot shortness. To overcome these difficulties to adequate mold filling, Mr. Cornell employs spray type gates and high injection pressures to fill the die before metal freezes. Die venting must be more generous than for aluminum. However, gating is similar for the two metals.

Second paper at this session was prepared by K. E. Nelson and F. P. Strieter, Dow Chemical Co., Midland, Mich., and presented by Mr. Nelson. Entitled "Castability and Property Comparison of Several Magnesium-Rare Earth Sand Casting Alloys," the paper dealt with the study of characteristics of magnesium - rare earth alloys used for parts employed in high-temperature applications such as in jet engines.

High temperature creep property was stressed and test results for this property were shown for 70, 400, and 600°F. A number of the alloys studied showed desirable creep characteristics at the elevated temperatures.

Third paper at the session was the official exchange paper from the Institute of Australian Foundrymen. Entitled "The Modification Technique of Aluminum-Silicon Alloys," the paper was written by R. H. Dyke, Defense Research Laboratories, Marybirnong, Victoria, and presented by Walter Sicha, Aluminum Co. of America, Cleveland. Mr. Dyke's paper covered the development of modification procedures for aluminum-silicon alloys to improve mechanical properties. Previous studies of modification showed:

Silicon in modified alloys occurs as globular types. Modification produces increased tensile strength and elongation and improved machinability. Remelting or holding a modified alloy in the molten state for prolonged periods results in reversion to the unmodified condition. During modification, silicon content of the eutectic increases and the temperature of the eutectic arrest on cooling is lowered, the amount of lowering increasing with the cooling rate. Addition of excessive amounts of sodium makes the alloy susceptible to gas porosity. Also alloys with only sufficient amounts of sodium to give modification will absorb hydrogen more rapidly than unmodified alloys.

Results of Mr. Dyke's work indicated that the most satisfactory modification techniques were: A binary flux amounting to 2 per cent of the charge weight of a 66 per cent sodium chloride—34 per cent sodium fluoride mixture allowed to remain on the metal for 15 minutes at 800° C; a ternary flux amounting to 3 per cent of the charge weight of flux containing 50 per cent sodium chloride, 35 per cent sodium fluoride, and 15 per cent potassium chloride allowed to remain on the metal for 15 minutes at 800°C; and sodium metal in the amount of 0.05 per cent of the charge weight, plunged beneath the metal surface at 800°C and the metal allowed to stand for 10 minutes before casting.

Work has shown that in modification with flux the sodium content of the melt will increase progressively during modification whereas when sodium metal is used the sodium content of the melt will reach maximum when solution of the sodium metal is completed and then decrease through oxidation and volatilization during the holding period required to diffuse the sodium throughout the melt. Consequently the risk of greater absorption of hydrogen is greater when sodium metal is used.

Degassing with chlorine-containing agents results in a loss of sodium. Therefore degassing with these agents should be done before modification. If degassing after modification is considered necessary, dry nitrogen should be used.

HEAT TRANSFER STUDIES.....

FIRST of two sessions sponsored by the Heat Transfer Committee was held Monday morning, with Dr. H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland, as chairman and E. C. Troy, foundry engineer, Palmyra, N. J., as co-chairman. The first paper, "Freezing of White Cast Iron in Green Sand Molds," by Dr. H. A. Schwartz and Dr. W. K. Bock of National Malleable, was presented by Dr. Bock. The paper reports on studies in which the time-temperature relations at the geometric center of white cast iron before, during and after freezing in green sand molds, were observed. The castings were rather small and very simple.

Based on the data presented, the authors concluded that the relation between time to cool to solidus (not the eutectic temperature but the temperature to which supercooling depressed the solidus) can be approximately represented by a line corresponding to the time being proportional to roughly a 1.5 power of volume-to-area ratio. A similar relation exists for the actual freezing time. Neither the relation between time spent for complete solidification, nor the freezing time corrected for supercooling, can be represented satisfactorily by a straight line.

Dr. Victor Paschkis, Columbia University, New York, in a written discussion on the paper, brought out the thought that perhaps Chvorinov, in his original work, may have been in error in formulating his law because he disregarded pouring temperature. In a written discussion by H. F. Bishop and W. S. Pellini, Naval Research Laboratory, and presented by Mr. Pellini, it was brought out that it is not possible to determine final freezing time on complicated shapes, although it is possible to do so for simple shapes. The discussion included the methods used by Chvorinov in determining his formulae, and what these mean. Dr. C. E. Sims,

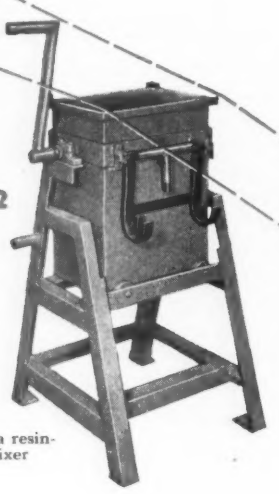
(*Continued on page* 163)

4 Steps to faster production better metal yields finer surface finish more accurate detail

1

The face of a steel pattern

2



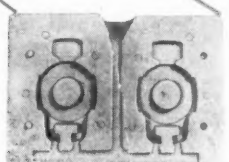
The "dump-box"—a resin-sand reservoir, or mixer

3

The pattern in place (face in) and dump-box inverted

Typical equipment used in laboratory evaluation of shell molding process.

4



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(*Continued from page* 161)

Battelle Memorial Institute, Columbus, O., referred to the various discussions on the end-effect on heat transfer and indicated that such consideration has not been given to side effect, which may be considerable.

In the second paper, Dr. Paschkis reported on the research projects sponsored by the AFS Heat Transfer Committee at Columbia for the business year ended in 1950. This particular work dealt with heat transfer in both dry and green sand molds, the latter experiments being based on certain assumptions that the "hot surface" of the mold is suddenly raised from room temperature to a high value and held at that value for a considerable time. The program was carried out in two steps, the preliminary experiment being based on the more simple concept that conduction in the green sand was the same as in dry sand, and that merely convection of moisture was superimposed on this conductivity. A technique of studying apparent thermal conductivity of moist sand, as presented by Y. Tanasawa of Tokyo, as included in the study.

Compare Green and Dry Sand

Results of the test showed that the rate of heat extraction in green sand is originally very high and quickly decreases to a much lower value. At very early times the rate of heat extraction of the moist sand is much larger than that of dry sand. As time goes on, the rate of heat extraction in the dry sand and in the moist sand becomes closer and closer. The moisture content thus exerts a stronger chilling action if the pouring temperature is lower. The fact that lower pouring temperatures are used in iron foundries is the reason why moisture content is more important in that type of plant than in steel shops.

A practical thought was injected into the discussion by John Perkins, Ford Motor Co., Windsor. He related experience in casting a cam 3½ in. in diam where a chill is used against a certain part and the remainder of the casting must be gray to provide good machining. With all variables held as constant as possible, with the exception of moisture, the company has experienced an inverse chill in the cams. If the moisture content is above 3.4 per cent this chill is experienced but if the moisture is held below 3.4 per cent, the chill is not discovered. The experts were not certain that the phenomena could be attributed to heat transfer and indicated it might be the presence of certain alloys, hydrogen which entered the metal on pouring, or other causes. Mr. Pellini emphasized that there is a long period in which moisture affects the heat transfer although the first layer of moisture is driven off as steam quickly.

The second heat transfer session under the joint chairmanship of Dr. Schwartz and Mr. Troy, considered these two papers: "Solidification of Steel From Sand and Chill Walls" and "Solidification of Gray Iron in Sand Molds." The first paper was prepared by H. F. Bishop, F. A. Brandt and W. S. Pellini, Naval Research Laboratory, Washington. The second paper was prepared by R. P. Dunphy and W. S. Pellini, Naval Research Laboratory.

In presenting the first paper Mr. Pellini, with the aid of many slides, stated that thermal studies of the solidification of steel from chill and sand walls have shown that solidification proceeds in wave-like fashion by the travel of "start" and "end of freeze" waves. Thermal characteristics of the mold walls determine the rate and mode of travel of these waves.

In the case of chill walls, which remove heat at a high rate, the two waves travel in conjunction, thus creating a band of freezing which proceeds to completion through isothermal liquid. In the case of sand walls, which heat at relatively low rates, the process is distinctly different in that the "start of freeze wave" completes its travel through isothermal liquid, separately creating a semisolid condition which extends through the entire casting. The effects of wall thickness and superheat of the metal have been shown to modify the timing and rate of progression of the freezing waves.

Similar in some respects, the second paper, presented by Mr. Dunphy, pointed out that thermal studies of the solidification of gray irons from sand walls have shown that solidification also proceeds wave-like by the travel of "start" and "end of freeze" waves. Austenite dendrite "start" and "end" waves travel in sequence—the "start" wave completes its travel to the center of the casting before the "end" wave begins, thus creating a semisolid condition through the entire casting. Eutectic formation proceeds by the travel of "start" and "end" waves in conjunction—as a narrow band. In each case the "start" waves move through isothermal liquid. The effect of superheat, carbon equivalent and seacoal in the sand have been shown to modify the timing and rate of progression of the freezing waves.

MALLEABLE IRON

ATTENTION of malleable iron foundrymen was directed to several practices and problems in three technical sessions and a roundtable luncheon held at the beginning of the week. First session on Monday morning was concerned with core sand practice, and speakers were E. J. Jory, National Malleable & Steel Castings Co., Cicero, Ill., and R. H. Greenlee, Auto Specialties Mfg. Co., St. Joseph, Mich. Chairmen were E. C. Zirzow, Deere & Co., Moline, Ill., and Fred J. Pfarr, Lake City Malleable Co., Cleveland.

Mr. Jory discussed core practice as related to foundry losses, and mentioned that in certain castings hot tears are eliminated by soft ramming. Core binding material should be held to the minimum to prevent core blows, and it is preferable to use finer sands to obtain suitable surface finish than to use a core wash. He suggested that judicious blending of base sands to produce a 5 to 6 sieve sand with 10 to 15 per cent of the grains below 100 mesh will result in desirable surface finish in most cases. He also said that it may be desirable to install additional personnel in the core department whose function would be to control quality. In the following discussion William G. Ferrell, Auto Specialties Mfg. Co., said that proper melting control established in his foundry practically eliminated hot tears, and Elmer Zirzow mentioned that in tests with strongly reinforced cores no hot tears could be produced.

Mr. Greenlee presented some information on modern core sand practice using resin binders, and concluded that they offer the foundryman a means of speeding up core baking time without sacrificing essential properties. Moisture content is an important factor in controlling surface hardness, and resin-bonded sands are worked at a higher moisture content. Use of release agents is helpful in overcoming stickiness. In response to questions in the discussion Mr. Greenlee said that little trouble had been encountered from dermatitis, but it was essential to observe personal cleanliness. No difficulty is encountered from fumes in baking, and while a slight odor is given off during pouring of molds, it is not objectionable.

At the second session, with Carl F. Lauenstein, Link-Belt Co., Indianapolis, and Fitz Coghlin Jr., Albion Malleable Iron Co., Albion, Mich., pre-

siding, effects of chromium and silicon on rate of anneal, and oxidation-reduction principles controlling composition were considered. J. E. Rehder, Bureau of Mines, Ottawa, Canada, pointed out that chromium neutralizes the graphitizing effect of four to five times its weight of silicon, and that it is possible to overcome this by several procedures. One is to increase the annealing time, another is to increase annealing temperature, and a third to increase silicon content. A combination of the three also may be used. The author presented several charts for practical use in determining the adjustments to be made with chromium increase.

Richard W. Heine, University of Wisconsin, Madison, Wis., discussed oxidation-reduction principles in controlling composition of iron, and stated that Si concentration regulates oxidation of C, and appearance of slag at lower temperatures, and a C boil occurs when the Si concentration drops. Percentage of C regulates reduction of SiO_2 or oxidation of Si at elevated temperatures. Mn, like Si, is protected from oxidation by C as long as C concentration is sufficiently high.

Final technical session on malleable iron was a continuation of the discussion of oxidation-reduction principles and a description of annealing furnaces and atmospheres. W. D. McMillan, International Harvester Co., Chicago, and William Zeunik, National Malleable & Steel Castings Co., Indianapolis, presided. Mr. Heine developed his discussion of oxidation and reduction by studies of air furnace melting and from data obtained showed that they applied. Si and Mn losses occur primarily during meltdown and at low temperatures. Final stages of the heat result in increasing Si content and protection of Mn through the reducing power of C at elevated temperatures.

A paper on "Malleable Iron Annealing Furnaces and Atmospheres" by O. E. Cullen and R. J. Light, Surface Combustion Co., Toledo, O., was presented by Mr. Cullen. It described features of furnace design and development of suitable furnace atmospheres for increasing speed of annealing, and reduction of scaling. Most recent development in the latter is adding metered quantities of air directly into the high temperature zone of the furnace. With proper control of quantities and directional flow of air, free oxygen is converted to CO_2 to provide suitable CO-CO_2 ratio in the atmosphere.

Concluding portion of the malleable program was the roundtable luncheon held Tuesday noon with James H. Lansing, Malleable Founders' Society, Cleveland, and R. J. Anderson, Belle City Malleable Iron Co., Racine, Wis., presiding. W. G. Ferrell, Auto Specialties Mfg. Co., spoke on cores; W. P. Gill, Harbison-Walker Co., discussed refractories for air furnace side walls and bungs, Ray Witschey, A. P. Green Fire Brick Co., Chicago, described refractories for furnace bottoms, and J. H. Rickey Jr., Ironton Fire Brick Co., Ironton, O., spoke on rammed or plastic refractories.

PLANT and PLANT EQUIPMENT.....

FIRST of two meetings sponsored by the Plant and Plant Equipment Committee during the convention had committee chairman James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., presiding and H. W. Johnson, Wells Mfg. Co., Skokie, Ill., as co-chairman.

Due to injuries sustained in an automobile accident, it was not possible for L. N. Schuman, National Malleable & Steel Castings Co., Cleveland, to be in Buffalo to present his paper, "Equipment and Methods of Straightening and Dimensional Inspection of Malleable Castings." Charles Snyder, also of National Malleable, did an excellent job as Mr. Schuman's substitute.

The paper outlined procedure followed at National Malleable in setting up a new pattern for production. It is first mounted in the foundry on a regular production setup and five or ten molds are produced under actual production conditions. Castings are thoroughly shot blasted and two sets are delivered to the inspection department for a complete layout. Use of a milling machine dividing head equipped with a three-jaw universal chuck permits a complete check in all planes with but a single setup. Other castings are broken to check physical defects. When samples satisfactory from a dimensional viewpoint are available, one set is sent for the customer's approval, several sets are annealed for a trial in the straightening dies and later shipped for proof machining in the customer's regular production equipment.

As part of the company's inspection procedure, quality control charts are maintained based on ten castings per shift. These charts are on such items, using a differential carrier for an example, as pinion bore diameter, pinion bore off center, flange thickness, flask shift and wall sections. After cleaning the castings are straightened in presses of 500 to 1000 ton capacity. The dies are made of contracting loose pieces which provide easy maintenance and replacement of worn pieces without complete die replacement. Each time a die is mounted or every 8 hours, whichever is first, 1000 pieces are gaged in a fixture which duplicates the customer's first operation.

Materials in the dies vary from low-carbon carburized steel to high-carbon alloy tool steels. Characteristics of torsion, compression, tension, shock and desired hardness are considered. Serrations are sometimes used to provide for the flow of metal on heavily coined areas. A large percentage of the dies are constructed by the company and their design is by the plant die engineer working under the supervision of the finishing superintendent. Gages for inspection are developed after a representative of the inspection department visits the customer's plant to determine the job requirements and locating points of the casting, after which a gage is developed to check the essential dimensions.

Describes Checking Procedure

"Dimensional Checking and Pressure Testing of Gray Iron Castings," by Kenneth M. Smith, Caterpillar Tractor Co., Peoria, Ill., the meeting's second paper, was presented by Frank Shipley, foundry manager, Caterpillar Tractor, due to the illness of the author.

The author pointed out that the first reason for dimensionally checking a casting is to be certain the pattern and coreboxes will produce a casting with the proper dimensions. Sample castings require a complete layout on a surface plate both for checking the pattern equipment and for checking the inspection fixture which may be used for routine checking of additional castings. Those with inaccessible inner walls must be sawed through at proper places to check pattern and corebox accuracy and core assembly accuracy.

Dimensional checking fixtures may seem complicated but they are built up of simple basic elements. The first requirement is a base rigid enough to support itself and the casting without deflection when the base is supported on only three corners. A box with a flat machined top and multiple internal diagonal ribs makes an excellent fixture base which also provides a convenient reference surface for setting up the fixture components. Brackets carrying gaging elements should be rigidly constructed. Both cam and screw type casting lift-

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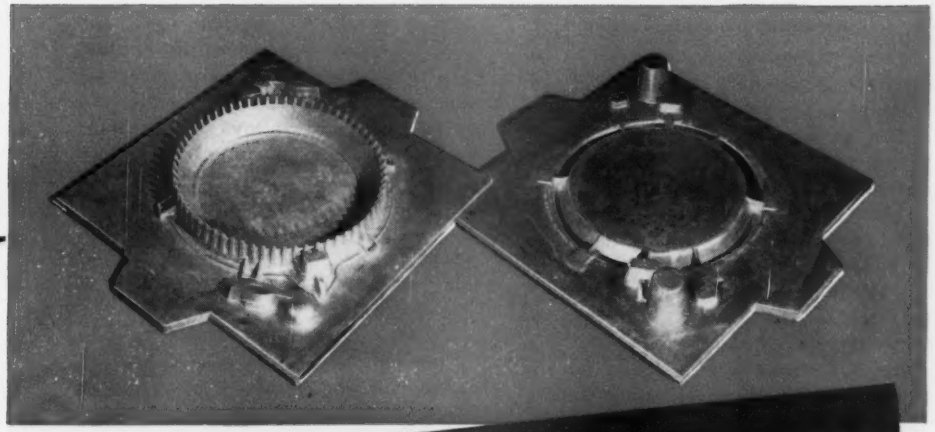
Specify



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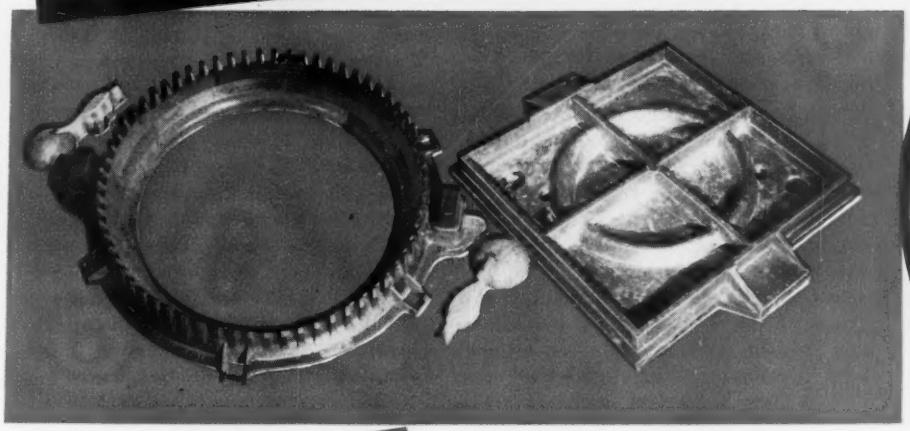

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(*Continued from page* 164)

ing and maneuvering devices can be used for positioning and holding the castings in the fixtures.

The author described a new universal pressure testing table recently developed for use in the Caterpillar foundry. This is a 34 x 80-in. cast iron table which has lengthwise T-slots at 6¼ in. centers machined into its surface to permit clamping the fixtures to the table in any desired arrangement. Casting clamping and support fixtures are designed for interchangeable use of as many fixture parts as possible. In most cases casting clamping actions and sealing pad motions are provided by air diaphragm units of the type used for air brakes on highway truck trailers. The casting support fixtures are individually designed with supports, locating stops, sealing pads, water inlets and air vents as needed. Wherever possible the support fixtures are designed for testing a group of similar parts by the use of adaptors and adjustable fixture parts.

Shows Up Leakage

One of the audience asked if it had ever been the experience at Caterpillar that a casting when tested did not leak under pressure but showed leakage at low pressure in use. Mr. Shipley stated that some castings for that reason are tested with kerosene instead of water since leakage shows up more readily with the former.

The second session was under direction of R. J. Wolf, Stone & Webster Engineering Corp., Boston, with approximately 200 in attendance. Discussing "Choice of Equipment for Nondestructive Testing," Carlton H. Hastings, physicist, Watertown (Mass.) Arsenal, discussed four of the most widely used methods of nondestructive testing used to determine soundness of castings—radiography, magnetic particle, penetrant and ultrasonic or acoustical tests.

Radiographic test equipment to suit foundry application should be predicated upon knowledge of penetrating power required, degree of flaw detectability desired and portability or convenience of use associated with equipment. Importance was emphasized of exposure time applicable to steel sections, aluminum alloys, etc.; correct handling and choice of equipment, and film selection. Advantage of using portable testing equipment should be subordinated to the need for equipment capable of casting penetration as well as capability of forming a good picture of the casting.

As compared to radiographic testing, which is applicable to all cast metals, magnetic particle tests for soundness can be successfully applied only to castings of ferromagnetic alloys such as ferritic cast irons and steels. Austenitic alloys of iron cannot be tested by this method. Choice should be based upon surface condition of the casting, degree of flaw detectability required, possibility of injuring casting by overheating or burning the metal and convenience of operation.

Penetrant tests include a variety of old and new versions of the so-called "oil and whiting" method, and choice of equipment or materials for implementation depends upon convenience of use rather than specific technical factors. Therefore, this group of tests involves patented techniques and their choice involves arbitrary decisions pertinent to particular types of castings. Prospective users should request demonstration of materials and equipment for particular inspection problems involved.

Ultrasonic or acoustical tests, when applicable to casting examination, may be employed to measure thickness of metal involved, even if only one side of the metal is accessible, as well as to detect unsound conditions. Wide range of the equipment is not currently available because of the newness of the method and patent restrictions, the choice now presented being primarily employed for thickness measurement. Echo techniques are preferred for thicknesses over 4 in.; for measuring thinner sections the so-called resonance technique employing different apparatus is more desirable. It was strongly recommended that ultrasonic equipment be demonstrated to be satisfactory for particular inspection by actual trial prior to purchase.

Slides were used to demonstrate the various types of x-ray units and radium capsules for radiographic inspection as well as bench-type magnetic particle inspection unit for wet method examination of small castings.

Following the paper a motion picture, "Mechanization in Molding," narrated by H. C. Weimer, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, was shown. This was a review of modern molding practices employed at the following widely separated foundries: Belle City Malleable Iron Co., Racine, Wis.; McCarthy Foundry Co., Thor Corp., Chicago; Fairbanks, Morse & Co., Beloit, Wis.; U. S. Radiator Corp., Detroit; Caterpillar Tractor Co., Peoria, Ill.; Lynchburg Foundry Co., Lynchburg, Va.; and Dalton Foundries Inc., Warsaw, Ind. Views included matchplate pattern equipment, cope and drag, wetting down, mulling, and squeezer operations, core and mold power conveyor systems, molding installation layout, overhead sand delivery belt, shakeout, pouring, hydraulically controlled slingers and other evidences of the advantage of mechanization.

MOLDING and CORE SAND.....

NINE papers dealing with various phases of core and molding sands comprised the Sand Division's program at four technical sessions. About 300 attended the opening session, under chairmanship of J. B. Caine, foundry consultant, Wyoming, O., assisted by R. H. Jacoby, the Key Co., East St. Louis, Ill., co-chairman.

"Compaction Studies of Molding Sands," a paper written by R. E. Grim and W. D. Johns Jr., State Geological Survey, University of Illinois, was presented by Mr. Johns. Compaction characteristics of Illinois fireclay and illite, Wyoming bentonite and Mississippi bentonite-bonded sands were studied by means of a special testing device, using varying amounts of sand-clay-water components. Slides showed equipment and construction of curves plotting piston displacements as a function of tempering water.

Illite and fireclay exhibited compaction properties distinctly different from the bentonite-bonded sands. Under similar conditions compaction decreased in the order of fireclay, illite, Wyoming bentonite and Mississippi bentonite. Compaction characteristics were correlated with differences in gross bulk densities. Relationships among compactability, gross bulk density, maximum green strength, and dry strength were brought out.

Written comment on the paper by Robert P. Schauss, Illinois Clay Products Co., Joliet, Ill., read by Mr. Jacoby, stated that the investigation compared favorably with results of a study made by Mr. Schauss, R. F. Baley and E. E. Woodliff, of factors affecting molding sand density, shrinkage, expansion and workability, reviewed in a paper presented at last year's convention. Mr. Schauss felt that the compaction studies went further.

A second paper, "Effect of Sand Grain Distribution on Casting Finish," by H. H. Fairfield, chief metallurgist, and James MacConachie,

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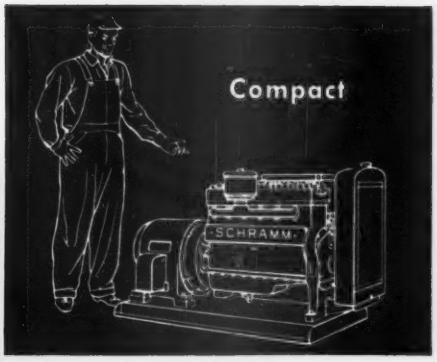

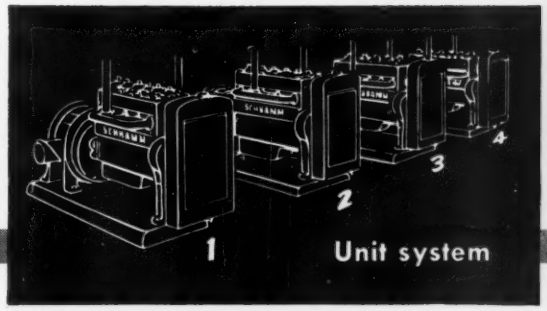

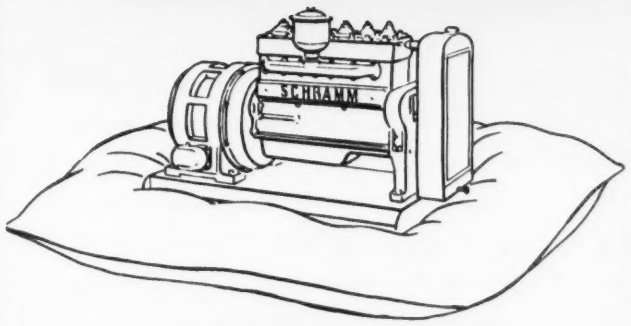

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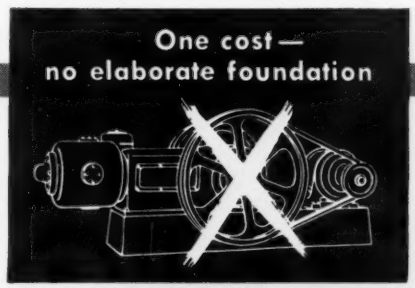

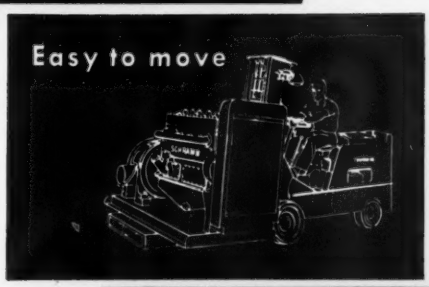

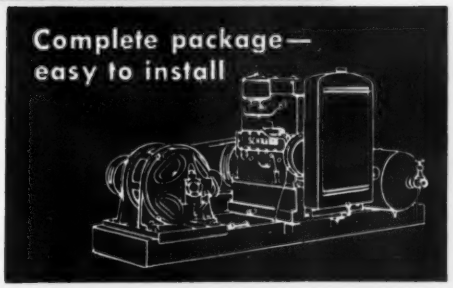

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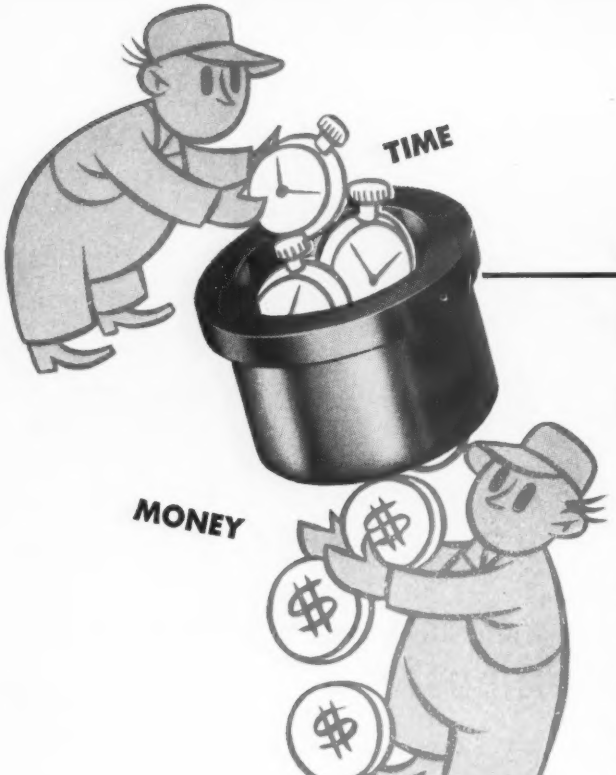

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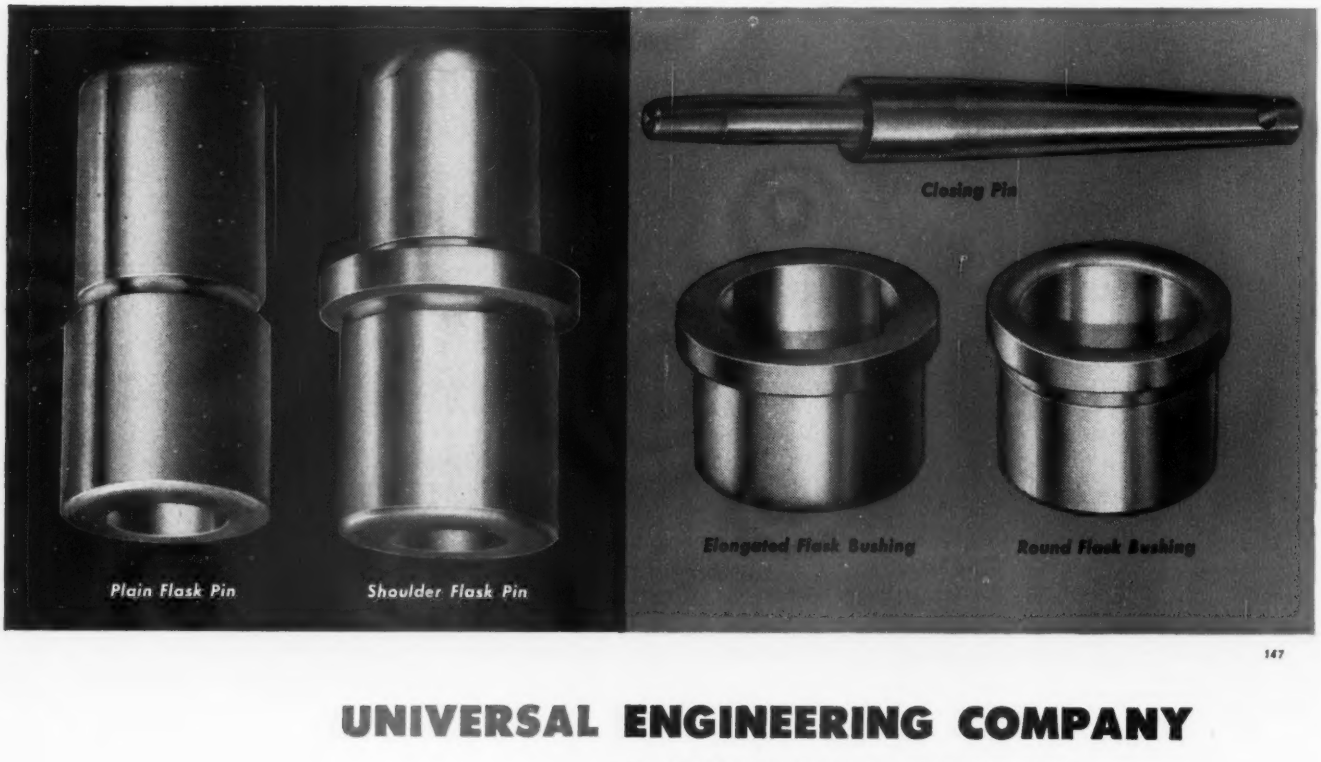

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(*Continued from page* 166)

sand supervisor, William Kennedy & Sons, Owen Sound, Ont., and presented by Mr. Fairfield, stated that in conducting research on casting finish it is necessary to use special molding techniques and to have a method of measuring surface smoothness. Six different types of sand grain distribution patterns were produced by blending screened silica sands. Bronze test castings were cast in these sands, a precision laboratory molding machine was used and molds were made with different degrees of ramming. Surface smoothness of the castings was measured using Hobman's method, profile measurements being made with a surface gage using a needle-tipped dial indicator. Test results indicated effect of average grain size and effect of permeability on casting smoothness and true flowability of different sands. Slides illustrated test casting as removed from mold, hand-operated jolt molding machine and grain size distribution patterns for the six sand mixes.

Several Factors Affect Finish

It was found from the tests that sand with the lowest permeability and highest grain fineness produced the best finish. Sand with a nonsymmetrical, broad distribution had best flowability rather than peaked or normal grain distributions. Evidence showed that if sand is jolted too much, casting finish is made rougher. It was recommended that further work be done to develop a more suitable flowability test than the standard flowability test now in use. To refute the latter recommendation Harry W. Dietert took exception to permeability and green deformation figures indicated in the molding properties and hot strength table as quoted, stating that although density and permeability are important factors, method of putting sand into the mold is most important.

Second sand session was under the direction of John A. Rassenfoss, American Steel Foundries, East Chicago, Ind., and was concerned with metal penetration. A report of the AFS Mold Surface Committee, prepared by S. L. Gertsman and A. E. Murton, Bureau of Mines, Ottawa, Canada, was presented by Mr. Gertsman. These data were similar to that contained in an article, "Metal Penetration," by Mr. Gertsman which appeared in the May FOUNDRY.

In the discussion Clifford Wenninger, University of Kentucky, inquired whether the authors had tried increasing moisture content of the sand to develop a counter head to counteract that of ferrostatic head. Reply was that while it probably would operate, no actual investigation has been made. Victor A. Zang, Unitcast Corp., Toledo, O., stated he had found the test method used by the authors served quite well in his foundry for determining suitability of core sands and mixtures for steel casting production.

H. A. Gonya and D. C. Ekey, Ohio State University, Columbus, O., prepared a paper entitled "Determination of Metal Penetration in Sand Molds" which was summarized by Mr. Ekey. It described a statistical approach for evaluating the effect of various factors such as sand, moisture, ramming, time in the mold and location in the mold. Method was that of the Greco-Latin square which permitted ascertaining the relationship of all factors at one time instead of separately.

C. C. Sigerfoos, Michigan State College, East Lansing, Mich., presented a progress report on effect of metal pressure and penetration which involved three core sands of different grain sizes. Data indicated that increasing ferrostatic pressure increases penetration. Decrease in metal temperature reduces penetration trouble. Metal used was gray iron, and composition appeared to have little, if any, effect on penetration.

Discuss Oil-Sand Cores

At the third sand session, B. Richardson, Steel Castings Institute of Canada, Ottawa, presented a paper, "Some Notes on Core Oil Testing," prepared in co-operation with A. E. Murton, Department of Mines and Technical Surveys, Ottawa, and H. H. Fairfield, Wm. Kennedy & Sons Ltd., Owen Sound, Ont. Second paper at this session, "Recent Advances in Dielectric Core Baking," was given by J. W. Cable, Thermex Division, Girdler Corp., Louisville.

E. C. Zirzow, Deere & Co., Moline, Ill., was chairman, with H. K. Salzberg, Borden Co., Bainbridge, N. Y., co-chairman.

Mr. Richardson said that tests were conducted with 19 core oils. Core mix used in this investigation consisted of AFS 50/70 test sand, 3000 grams; test core oil, 30 grams, and distilled water, 90 grams. Baking was done in an electric oven, and comparisons were made at 125 psi core strength.

Results indicate that heating elements should be installed at both top and bottom of the oven and a positive draft system (exhaust fan) should be incorporated in the chimney to obtain uniform core baking. General trends for vegetable-base core oils showed that oil-sand mixtures attain maximum strength more quickly when baked at high temperatures than at lower temperatures; they retain maximum strength over a longer bake time interval at lower temperatures. Furthermore, most all core oils reach maximum strength at almost the same time when baked at a given temperature.

Storage of cores under varying humidity conditions was studied. Test conditions were room temperature and relative humidities of zero, 50, 75, and 100 per cent. It was shown that increasing humidity lowers core baked strength and that most of the weakening takes place within the first 24 hours.

Tests conducted on the effect of high oven humidities on baked strength of core oils showed that moisture level in the core oven does not affect strength but does affect time of bake, requiring longer baking under more humid conditions.

Note No Basic Changes

In his paper Mr. Cable pointed out that there have been no basic changes in equipment used for dielectric core baking since the equipment first was made available. Some improvements have been incorporated, however, such as increased capacity and use of higher electrode voltages to improve heating ability. Binders have been improved, and the speaker sees a trend toward developing binders that cure at lower temperatures.

Mr. Cable went on to point out advantages of the dielectric drying process, citing statistics in various phases of coremaking to substantiate claims of superiority. He also discussed the development of driers made from polyester casting resin, reinforced with glass fiber, pointing out that cores can be blown directly in them.

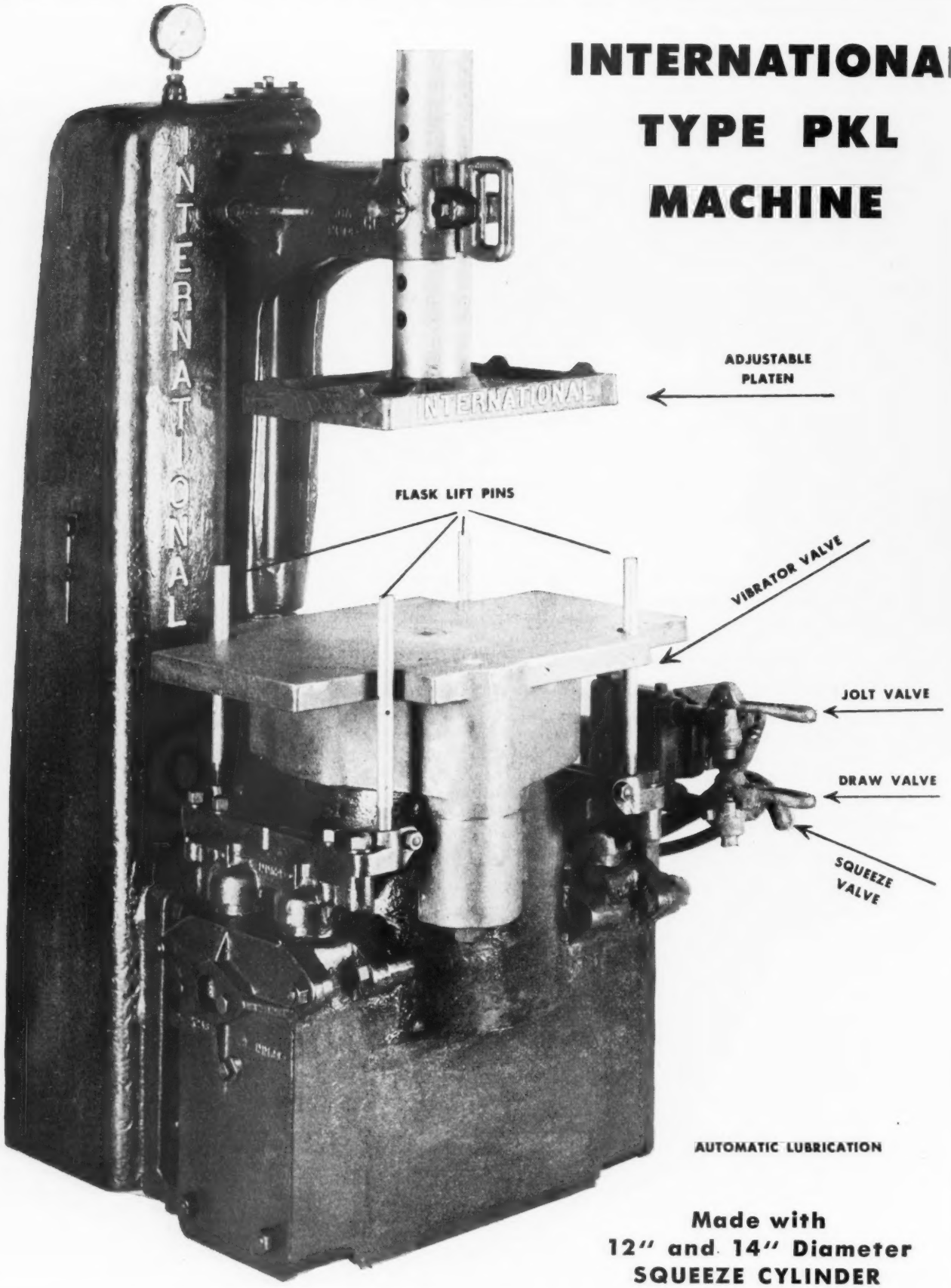
During the discussion Warner B. Bishop, Archer-Daniels-Midland Co., Cleveland, pointed out that properly formulated, average oil-sand mixtures, conventionally baked, do not show cost differentials in favor of resin mixtures, dielectrically baked, as indicated by examples cited by Mr. Cable.

Charles A. Barnett Jr., Foundry Equipment Co., Cleveland, commented that modern, conventional core baking equipment, using properly formulated oil-sand mixtures and employing materials handling equipment in keeping with modern standards, compares favorably on an economic basis with dielectric drying and resin-sand mixtures.

Concluding technical session on sands was directed by Clyde A. Sanders, American Colloid Co., Chicago, and Harry W. Dietert, Harry W. Dietert Co., Detroit. A paper, "Silica Sands-Sieve Analyses," prepared by A. I. Krynitsky and F. W. Raring,

(*Concluded on page* 172)

INTERNATIONAL TYPE PKL MACHINE



Made with 12" and 14" Diameter SQUEEZE CYLINDER

INTERNATIONAL MOLDING

LA GRANGE, KY.

INTERNATIONAL TYPE PKL MACHINE

JOLT, SQUEEZE, AIR PIN LIFT

This machine is of a very rugged character. The column, squeeze head and platen are made of cast steel. The squeeze cylinder, squeeze piston, jar cylinder and jar table are made of wear-resisting iron.

All parts subject to wear have replaceable bushings of either brass or hardened steel. There is a threaded adjustment on the lower ends of the lift posts so that they can be set at the right height to suit the thickness of the pattern plates to be mounted, and the centers of the lift posts can be readily set to suit the sizes of flasks to be used,—note specifications on the following page. Type PKL comes equipped with pop valves, air gauge, vibrator and cleaner valve.

NG MACHINE COMPANY

RK, ILLINOIS

(*Concluded from page* 169)

National Bureau of Standards, Washington, was presented by Mr. Gardner of the same organization. It described an investigation of two commonly used devices for sieving sands to separate them into different grain sizes. Results indicate that reproducible data can be obtained.

W. H. Moore, Meehanite Corp., Cleveland Heights, O., described a new sand testing method for determining the toughness of a molding or core sand at high temperature. In the test a sand specimen ¾-in. in diam is heated to 2000° F and subjected to a blow from a swinging hammer similar to an impact test of a material. Data obtained with the test indicate that sands with high toughness or impact resistance are free from buckling and allied defects. (This testing method was described in January FOUNDRY, p. 152.)

Session was concluded with a progress report of the AFS Committee on Physical Properties of Iron Molding Materials at Elevated Temperatures presented by Victor M. Rowell, Kordell Industries Inc., South Bend, Ind. Report related to scab defect on gray iron castings, and conclusions were that nonscabbing sands should have a green compressive strength above 10 psi; rammed density should be below 110 lb per cu ft; green deformation should be less than 0.021-in. per in.; silt content below 8 per cent; dry strength under 150 psi; hot deformation at 1000° F should be greater than 0.009-in. per in., and permeability over 50.

MARKET DEVELOPMENT-MOBILIZATION CONFERENCE

Held by Malleable Founders' Society

By WILLIAM G. GUDE
Managing Editor
FOUNDRY

A SUCCESSUL market development-mobilization conference was sponsored by the Malleable Founders' Society at Rensselaer Polytechnic Institute, Troy, N. Y., Apr. 19-20. Approximately 60 malleable iron foundry representatives participated in a diversified discussion of the industry's marketing, metallurgical and design problems.

The program was opened with brief introductory and welcoming remarks by Cal C. Chambers, society vice president, and president of Texas Foundries Inc., Lufkin, Tex., and by Livingston W. Houston, president of RPI. Roy C. Hobson, National Malleable & Steel Castings Co., Cleveland, and chairman of the society's Market Development Committee, presided at the two-day session.

An outline of characteristics, limitations and applications of malleable iron castings was presented by W. A. Kennedy, supervisor of products, the Grinnell Co., Providence, R. I. He listed various applications and properties of the cupola, standard and pearlitic types of malleable iron. One of the interesting applications described was a glass-lined valve body. The heating process required in application of the glass was found to produce increased tensile strength in the metal and provide a 4 per cent elongation. Mr. Kennedy said that malleable iron has been undersold to the public and that it is time to present more information concerning the material's desirable characteristics.

Viewpoints of the designer concerning malleable iron were offered by D. R. Meier, assistant engineer, General Electric Co., Erie, Pa. Mr. Meier said that it is not easy to determine loads on parts or the stresses imposed in service. Likewise, it is difficult to match material properties with the load imposed. A test bar is not always indicative of casting quality, and pulling a bar does not produce the effect of combined stresses such as are experienced by a casting.

In discussing the residual stresses present in various forms of metal, Mr. Meier showed samples of steel bar stock which, when cut apart, developed taper because the residual stresses were removed in machining. He recommended increased attention to the problem of eliminating or reducing residual tensile stresses. In most cases, the engineer must fall back on his experience in designing parts because he is unable to measure loads or evaluate material properties accurately. Ductility in a metal is important when stress concentration occurs. This factor makes use of malleable iron desirable in numerous instances, although the material ordinarily is avoided for use where compression is high. Engineers, the speaker declared, want better mechanical properties, closer tolerances and more uniform quality in castings.

Dr. Wendell Hess, head, Department of Metallurgy, RPI, said that some textbooks employed in engineering schools are not too accurate in certain respects and he suggested that malleable foundrymen contact publishers of such books to recommend changes in chapters dealing with malleable iron where information given is not believed complete nor accurate. He also said that engineering schools need movies which will show more technical details of foundry operations than are contained in such films now available. Since students are reluctant to buy technical handbooks such as are prepared by foundry societies, he suggested that condensed material which can be prepared inexpensively be provided.

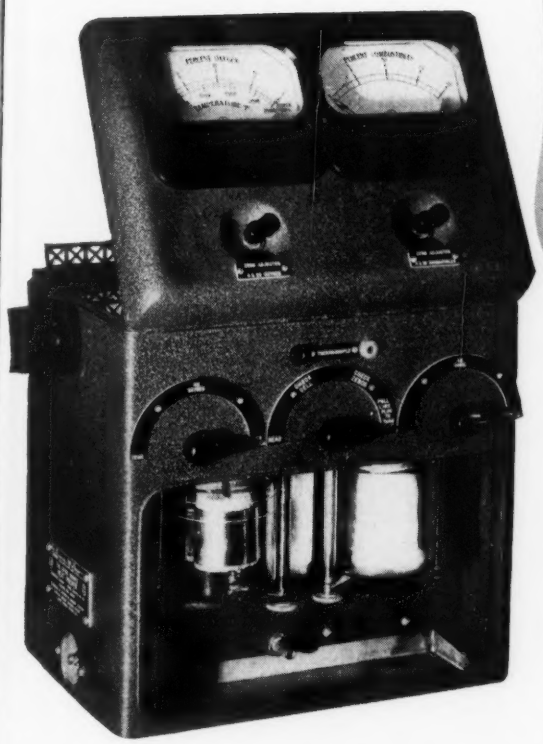
The extensive use of pearlitic malleable iron in military, automotive and other applications, are indicative of the advantages of this material, it was stated by Ralph T. Rycroft, president, Kencroft Malleable Co., Buffalo, and president of the Malleable Founders' Society. Mr. Rycroft pointed out that pearlitic malleable offers an opportunity for malleable iron foundries to enlarge their markets for certain applications where standard malleable is not suitable. He indicated that pearlitic is harder, stronger and more resistant to abrasive wear but less ductile than standard malleable. Its casting qualities are comparable while the same is true of its machinability. The latter property is superior to that of forgings or bar stock of the same brinell hardness.

Specifications for the five ASTM grades of pearlitic malleable were described. Pearlitic malleable castings can be surface hardened with good results, as evidenced by applications for sprockets, gear cases, camshafts, etc. Annual production of pearlitic malleable iron castings in recent years has exceeded 30,000 tons, but Mr. Rycroft believes that a substantially larger market is possible through conversion from other types of castings.

A resume of nodular iron applications was presented by Thomas E. Eagan, chief metallurgist, Cooper-Bessemer Co., Grove City, Pa. In describing casting characteristics, he said that the metal has extremely good flowability, but liquid shrinkage is greater than that of gray iron, although less than that of steel. Slag is somewhat of a problem in pouring, and use of a teapot ladle is recommended. The metal works better in

(*Concluded on page* 174)

I SPY



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QUALITY PETROLEUM PRODUCTS

(*Concluded from page* 172)

dry sand molding than in green sand. A typical analysis includes manganese below 0.40, phosphorus below 0.10 or as low as possible, magnesium 0.06 to 0.08, total carbon 3.40 to 3.80, silicon 2.40 to 3.00, sulphur below 0.10. Mr. Eagan said that while the basic cupola offers strong advantages in producing nodular iron, trouble is encountered if nodular iron heats are interspersed with those of ordinary gray iron.

Major L. A. Ramsey, head of Research and Development Section, Watervliet Arsenal, Watervliet, N. Y., gave an interesting review of developments in armament, tracing the changes in design of weapons, principally cannon, since early days. Casting requirements of the U. S. Navy were discussed by Clyde Frear, senior materials engineer, Bureau of Ships, Washington. Mr. Frear explained that naval castings frequently are required to stand up under conditions not experienced in ordinary commercial applications. Consequently, specifications in many instances are higher than average.

Keep Abreast of Methods

In discussing the subject "Management Looks at Selling," G. J. Behrendt managing director, Eastern Malleable Iron Co., Naugatuck, Conn., warned against offering to do the impossible in the way of deliveries, tolerances, surface finish, etc. At the same time he urged salesmen to be able to assist their customers in developing cast parts. He also recommended that salesmen keep abreast of operating methods and new equipment, and suggested service engineering as good training for sales work.

Speaking on the purchasing agents' point of view, F. J. McMillen, purchasing department, American Locomotive Co., Schenectady, N. Y., explained that production of diesel electric locomotives requires interchangeability of parts and relatively close casting tolerances. This was not true when steam locomotives predominated, since many of these were custom jobs.

He recommended that the foundries' production control department keep the sales department advised on required lead times. Efficient selling of castings requires that the buyer be made aware of the full possibilities of the product. The casting salesman should point out the possible design changes in proposed castings before the part is in production. While it is necessary that foundries have sufficient capacity to handle any demand, the plant also should be able to take care of short runs for new developments. The speaker indicated that government restrictions may cause increased demand for malleable castings as substitutes for steel, aluminum and copper-base alloy castings.

Results of a pilot study made among producers and consumers of malleable iron castings to evaluate factors relating to the malleable market, were presented by G. LeRoy Kemp, Charles L. Rumrill & Co., Rochester, N. Y. Among the comments by consumers were these: The malleable iron industry has lagged in telling what it has accomplished; there is a need for uniform product and improved inspection; foundries sometimes have acquired the habit of thinking that users will accept poor work and poor deliveries; salesmen frequently are uninformed concerning the application of their product. Other users recommended that the malleable industry direct its education of the product possibilities of malleable iron to production men. It was also stated that the industry has not made sufficient strides in selling its product. An extension of this study by the society is proposed for the future.

PISTON RING: The 29-in.-diam piston ring shown here is said to be the largest gray iron ring ever cast centrifugally. It is one of 36 rings made by the Double Seal Ring Co., Ft. Worth, Tex., for a diesel power plant

A short skit, entitled "Selling Malleables Today," was enacted by William T. Cole, Canton Malleable Iron Co., Canton, O., R. W. Crannell, Lehigh Foundries Inc., Easton, Pa., and James H. Lansing, technical and research director of the society. This skit illustrated various of the characteristics and advantages of malleable iron castings in commercial applications.

Understanding the needs and problems of customers is necessary if the salesman is to make them satisfied customers, it was stated by H. T. Blumenauer Sr., president, Albany Castings Co., Voorheesville, N. Y. In his talk, entitled "Evaluating Salesmanship," Mr. Blumenauer offered various recommendations for developing satisfied customers. He emphasized that good salesmanship requires attention beyond the mere acceptance of an order and that subsequent follow-up actually completes the act of selling. Don't let worry over price cutters be followed by retaliation, he warned; it hurts the price cutter worse than it does you.

Developments at Washington affecting the malleable castings industry were discussed by Lowell D. Ryan, managing director of the society. He explained that many rules and regulations proposed by NPA and OPS still were in the conversational stage at that period. Orders already issued by those agencies were described. Concerning the future, he indicated that production of malleable iron castings this year might go as high as 1,400,000 tons, although government regulations and labor shortages may curtail tonnage in future months.

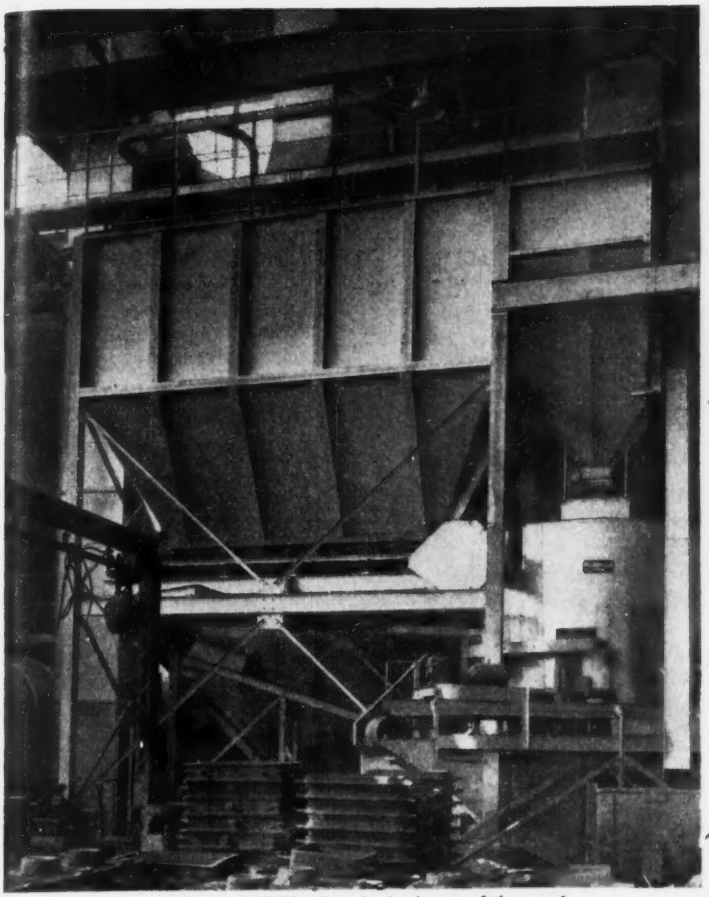
C. M. Brennan Jr., president, New Haven Malleable Iron Co., New Haven, Conn., discussed methods of using sales material of the society effectively, including the film, "This Moving World," the society's handbook and other sales tools.

Discuss Selling Methods

A panel discussion concerning various subjects relating to selling, including the training of salesmen, was conducted by Mr. Hobson and D. L. Boyes, sales manager, Central Foundry Division, General Motors Corp., Saginaw, Mich.; Wm. T. Cole, Canton Malleable Iron Co., and Mr. Brennan.

For a considerable period not enough importance has been attached to selling in the malleable castings industry, it was stated by Thomas A. Scanlan, director of sales, Eastern Malleable Iron Co., Naugatuck, Conn. The salesman is the link between management and the customer, he pointed out, and selling today must be revitalized. It is up to the salesman to insist on both quality control and efficient inspection. Close contact with customers requires that salesmen be calling frequently on their buyers, not only when orders are needed.

A dinner session Thursday evening had Roy Howells, Philadelphia, as a speaker on the subject "Get on the Beam." Entertainment was furnished by the Rensselaer Polytechnic Institute Glee Club.



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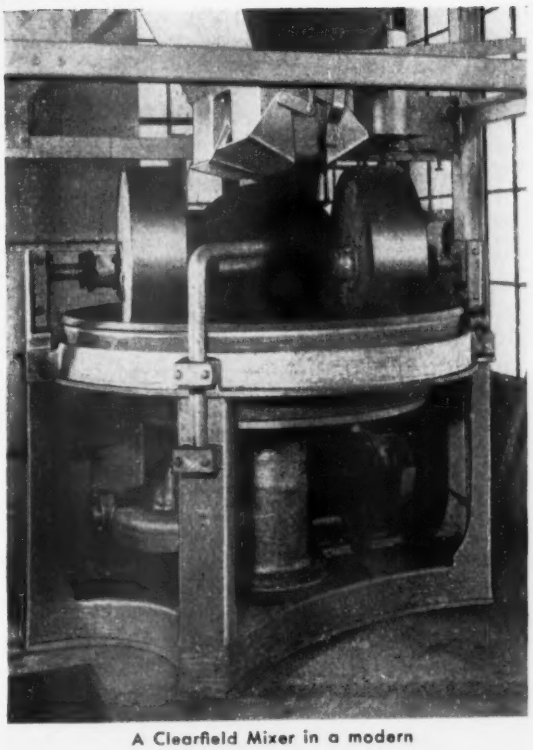

A Clearfield Mixer in a modern brass foundry.

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MIXES, TEMPERS AERATES

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By EDWIN BREMER

Foundry DEVELOPMENTS

MINIATURE blast furnace working with slag may prove to be one of the most important furnaces in the country, according to American Iron & Steel Institute. Furnace, 16 ft high, started operating early in March at Pittsbugh in an attempt to recover manganese from open-hearth furnace slag. Some research metallurgists believe an estimated 440,000 tons of manganese per year may be found in economically recoverable slag, or 68 per cent of the amount used in steel manufacturing in 1950. Small blast furnace is intended to simulate conditions in a commercial structure to remove deleterious elements such as phosphorus. If theory being tested at Pittsburgh proves practical, a useful ferroalloy containing 80 per cent manganese will be produced. Other methods of recovering manganese from slag are being studied at College Park, Md.

* * *

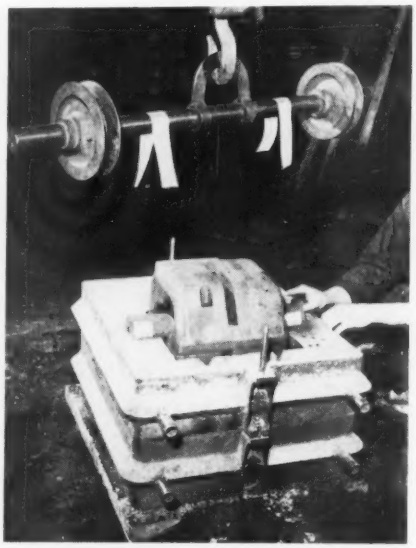
AUTOMATIC compiling of two measurements and plotting of a curve to show their relationship, namely Y equals f(X), is made possible by a new electronic instrument developed by Brown Instruments Division, Minneapolis-Honeywell Regulator Co. Instrument incorporates two measuring systems; one actuates the recorder pen, the other motivates the chart. With this arrangement the chart is moved up and down in response to changes in one variable simultaneously with the movement of the pen in response to a change in a second variable, resulting in a curve which continuously evaluates one variable in the terms of the other. It is claimed that movements over the entire curve are continuous, and no interpolation is needed to complete data between points of measurement.

* * *

THIRTEENTH volume of the *Bibliography of Technical Reports* (January-June 1950) now is indexed by subject, according to the Office of Technical Services, U. S. Department of Commerce, Washington 25. Copies of the *Subject Index to Volume* 13 may be purchased from that bureau for $1 each. Also available from OTS at $1 each are indexes to volumes 6, 10, 11 and 12. Indexes to volumes 2 and 3 are available for 35 cents each.

* * *

USE OF pressure-sensitive Scotch tape will eliminate the need for lifting eyes, straps, etc., in handling heavy sand cores weighing up to 150 lb., according to John J. Uppgren, instructor of foundry practice, University of Minnesota. As shown in the accompanying illustration, the tape is attached over the core prints, lifting beam and over itself. After positioning the core in the mold the tape is cut and the loose ends stuck to the prints. Molten metal does not come into contact with the tape as it is on the ends of the prints. For experiments tapes 1½ and 2 in. wide, having tensile strengths of 270 and 360 lb, respectively, were used. Tape is made by Minnesota Mining & Mfg. Co., St. Paul, Minn., and available in 72-yd rolls in several colors as well as transparent.



* * *

AMERICAN Standards Association, 70 East 45th St., New York 17, has just approved American Standard Malleable-iron Screwed Fittings, 300 lb, B16.19-1951. Pressure-temperature ratings given are liquid and gas at 150° F, ¼ to 1 in. inclusive, 2000 psi; 1¼ to 2 in. inclusive, 1500 psi; 2½ and 3 in., 1000 psi. Steam and oil rating for ¼ to 3 in., inclusive is 300 psi at 550° F. Standard also gives dimensions for various fittings. Standard was jointly sponsored by American Society of Mechanical Engineers, Manufacturers Standardization Society of the Valve and Fittings Industry, and the Heating, Piping and Air Conditioning Contractors National Association.

* * *

SPEAKING before the recent meeting of American Society of Tool Engineers, Hubert M. Golman, Ethone Inc., New Haven, Conn., pointed out that a wide variety of abrasive mediums are employed in tumbling to clean and impart finishes to metal and nonmetallic parts. They include dry ice, nut shells, stones, steel balls, cinders, cracked corn, ground corn cobs, sand and others. Each is useful to accomplish a different kind of job or to produce a different degree of finish. Dry ice is used to remove fine molding fins from edges of rubber products, by freezing the fins and making them brittle. The tumbling action breaks them away.

* * *

AVAILABILITY to science and industry of an ultimate standard of length recently was announced by the National Bureau of Standards and the Atomic Energy Commission. Standards consist of spectroscopic lamps containing a single pure isotope of mercury. Known as the NBS-Meggers Mercury 198 lamps prepared under the direction of Dr. F. W. Meggers, they contain about one milligram of Hg^{198}, and they emit a wavelength of green light near 21 millionths of an inch with a reproducibility greater than one part in a billion. Request for information and applications should be made to the Co-ordinator of Atomic Energy Commission Projects at National Bureau of Standards, Washington 25.

* * *

AUSTENITE formed during prolonged heating of low-manganese nickel-steel is the subject of a study by the Naval Research Laboratory which indicates that the amount of austenite and its decomposition characteristics are determined by formations temperature and duration. Mechanical property data obtained show that if austenite decomposes during cooling, tensile ductility and impact resistance will be decreased. If austenite is retained it will decrease yield strength. If it transforms during plastic deformation it will increase tensile strength, lower elongation and reduction of area, and reduce notch toughness.

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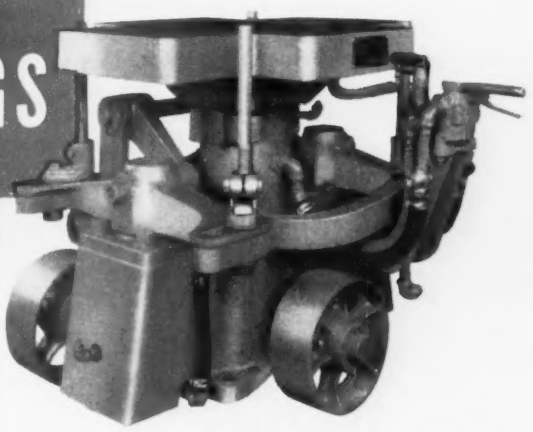
JOHNSTON & JENNINGS



FOR COPES . . .

The 68-S Stationary or
The 68-SP Portable

JOLT-STRIPPER OR PIN-LIFT

Companion machines to the 612 *Pacemaker*, the 68-S and 68-SP are designed especially for the high production of copes. The draw is positive and its speed can be regulated to meet different requirements. Lift pins are easily adjusted to accommodate a wide range of flask sizes. Like the 612, all of the working parts are fully enclosed and all important bearing surfaces are provided with removable bushings. Table size 24 x 30 inches—Pattern draw 8 inches—Capacity 600 pounds.

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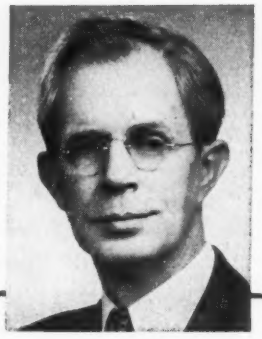
MAN-TO-MAN

on the Molder's Bench

"Feudin' in the Foundry"



By RALPH L. LEE

NINE times out of ten, after visiting a foundry, I come away all hopped up with what I saw and learned, but I guess we've got to take the bitter with the sweet. For I don't know when I've ever felt bluer and more helpless than I did after a foundry visit I made some time back.

I had been invited to go through several plants belonging to a manufacturing concern which had sponsored my speaking engagement in its city. Just as we were going in the front door of Plant 1 my guide, who was explaining the surrounding sights, happened to mention that the building down at the end of the street didn't belong to them, but was a foundry.

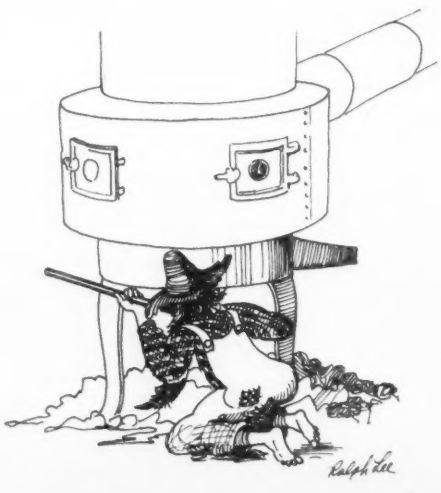
From the way I perked up at the mention of the word "foundry" my guide must have gathered that if it had to be a toss-up I'd just as leave visit that foundry as I would his plant. I've got to watch this foundry bias of mine. Anyway, after a most interesting visit through the bang-up manufacturing setup we went on down to the foundry.

The top man wasn't there, so I met the superintendent, who happened to be the top man's son. It didn't take us long to get our hair down and into shop talk clean up to our necks. Knowing how hard all of us are trying to interest young men in the foundry business, I warmed up to this young fellow.

It seems that their cupola man had up and quit without notice, leaving the young fellow to take over the job without much background or experience. I tried my best to answer some of the questions he was anxious to ask, after warning him that I was just an amateur. Then I asked him whether he had the Foundrymen's Society's handbook on cupola practice — which he didn't — whether he was a member—which he wasn't—and whether he took our FOUNDRY magazine. He did take the magazine, although from what he said I gathered that he was so thoroughly pooped out at the end of each day's struggle that he didn't have enough strength left to even scorch the candle at one end.

I couldn't help but think—here was the very kind of fresh material we want to get into the foundry business, all set up with some college background and yet floundering around pretty much on a catch-as-catch-can basis.

With only a limited amount of time to spend with my young man, and wishing to make the most of it, I hurried back to the office in hopes of meeting his dad and maybe suggesting some sort of an arrangement for the young fellow to gear in more with the industry, with the society and to take more advantage of the help we foundrymen like to share with each other.



I met the boss alright, but it didn't take more than a dozen words one way and the other for it to become perfectly evident that there was family feudin' of the rankest hill-billy type going on there. To every suggestion came the same sort of an answer—"You can't tell him nuthin' —he won't listen to me—everybody else but not me—he's got to find out for himself."

Two reactions came to me. First, the foundry business must be tougher than a mule to stay alive under such conditions. And second, as tough as it is feudin' is one sure poison for laying it low.

Now the funny thing about this visit is that the company whose plants I had been visiting was strictly a family affair. My principal host was one of the sons of the president, who in turn was the son of the son of the founder of the business. My host's brother was also in the business. During a wonderful visit with their father it became as plain as the nose on my face why the one-family affair clicked and the other didn't.

There can be no question that young men raised in a family dedicated to a particular craft have one whale of an advantage over other young men who have to start alone from scratch. They hear the lingo from the time they can talk and, without realizing it, they automatically accumulate information that the other fellow has to dig out piece by piece all by himself, so to speak. These folks have a running start even before they go to school.

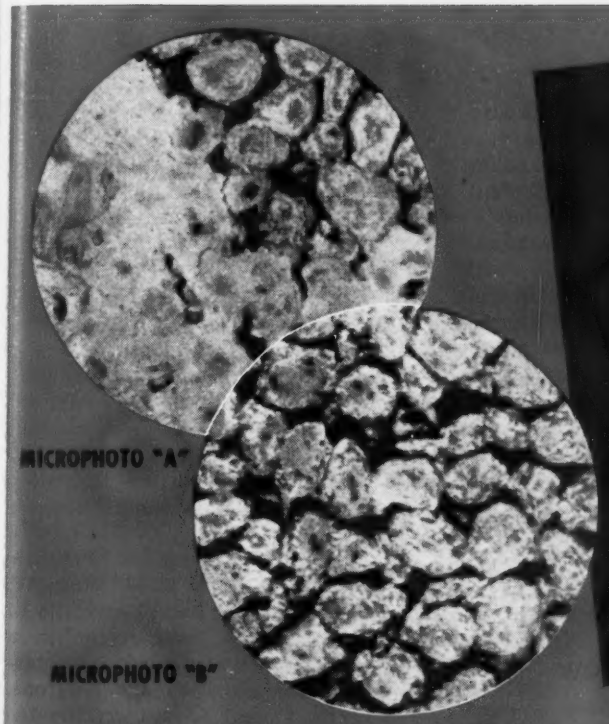
On the other hand, most boys can't remember the time when they didn't have a father. Dad becomes as much a part of the scenery of the old homestead as the steps to the back porch, and is taken almost as much for granted. This means that it's hard for young men to picture their dads at being somebody of note let alone wonderful. Even mediocre outsiders like me are likely to out dazzle old Pop with ordinary information that's new to them.

So with this fundamental situation, coupled up with an instinct of most fathers to feel without thinking that they own their kids, who will never fully grow up, and who will not take into account how natural it is for the kids to take them for granted—well, to put it mildly—we have all of the elements for real feudin'.

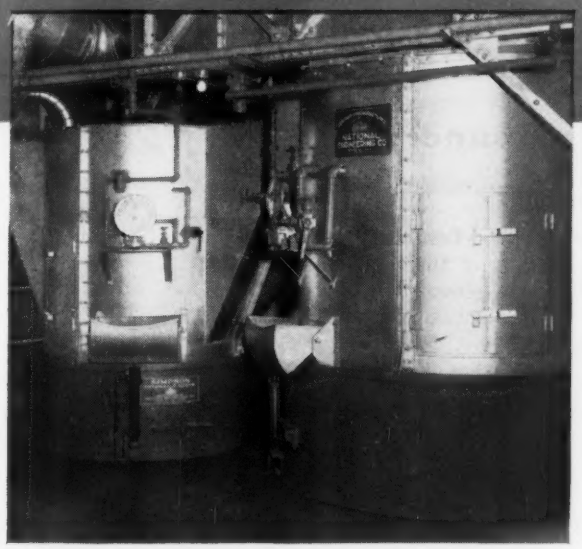
I was just wondering whether there are enough father-and-son combinations in the foundry business to make

(*Concluded on page* 180)

Scientific tests prove superiority of SIMPSON MIXERS in producing QUALITY sand for QUALITY castings



Above: Microphoto "A" shows sand improperly prepared . . . note the smear of unmixed materials. Microphoto "B" shows sand prepared in a Simpson Mixer. Note even bond distribution covering each sand grain.



Illustrated above is a typical installation of two Simpson Mixers in a large foundry to provide better sand at lower cost.

Simpson Mixers are built in sizes to produce from 5 to 60 tons per hour.

THERE are almost as many methods of preparing foundry sand as there are formulas for obtaining the mix most suitable to meet your individual needs. But one basic fact stands out . . . *the best possible method of sand preparation is determined only by the quality of castings produced.*

Years of scientific tests plus hundreds of successful applications have proved beyond doubt that the Simpson principle of intensive mulling provides the common denominator—*quality* sand—which is absolutely essential for *quality* castings.

We'd like to prove our point. Let a National Engineer show you how to improve casting quality by properly prepared Simpson-mulled sand. *For further details write for a copy of Bulletin 489.*

SIMPSON MIXERS

NATIONAL *Engineering Company*

608 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents: For Continental European Countries—George Fisher, Ltd., Schaffhausen, Switzerland; for British Possessions—August's Limited, Halifax, England; for Canada—Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney; for Argentina, Brazil and Uruguay—Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico—CASCO, S. De R.L., Mexico, D.F.

(*Concluded from page* 178)

this story of general interest. I asked Mother (that's my home superintendent, the vice president in charge) what she thought and she said she imagined it would be—"Then, too," she added, "it doesn't always take blood relationships to start this paternalistic feuding between the old and the young." We both agreed that, regardless of how it starts or where, it's darned bad for the foundry business.

Gray Iron Welding Manual

Gray Iron Founders' Society, 210 National City—East Sixth Bldg., Cleveland 14, recently published a booklet entitled "Welding, Joining and Cutting of Gray Iron." Written by Charles O. Burgess, society technical director, the booklet is priced at $1.50.

The author points out that gray iron castings can be welded economically and successfully, using new processes and improved techniques. Engineering considerations which make a certain welding process or combination of welding processes most suitable in a given case are outlined.

Equipment Company Has Its 50th Anniversary

This year marks Stephens-Adamson Mfg. Co.'s 50th anniversary in production of bulk materials handling equipment at its Aurora, Ill., plant. Company began operations in an 80 x 120 ft building in June, 1901, and today occupies a 13-acre site with 230,000 sq ft of plant space. Branch plants are located at Los Angeles and Bellville, Ont., with sales offices in principal cities in United States and throughout the world. Makers of conveyors, elevators, conveyor elevators and transmission equipment, the company now also produces its own bearings. During its first 50 years the company has made many contributions to progress in the materials handling field.

Book Review

AFS Research Progress Reports, 1950-51, 8¼ x 11 in., paper, published by American Foundrymen's Society, Chicago. Price $2 to members and $4 to nonmembers.

Included in this collection of reports covering research projects sponsored by the society are:

"A Study of the Principles of Gating," by K. Grube and L. W. Eastwood, research engineer and supervisor, respectively, Battelle Memorial Institute, Columbus, O. This report covers the period May 1, 1949 to June 1, 1950 and is limited to the study of pouring methods, the design of pouring box, sprue, and horizontal runner and gate systems.

"Melt Quality and Fracture Characteristics of 85-5-5-5 Red Brass," by F. M. Baker, C. Upthegrove, and F. B. Rote, department of metallurgical engineering, University of Michigan, Ann Arbor, Mich., is the second report in the study and presents data obtained in the search for a more rapid method of evaluating the alloy melt quality on the basis of fracture characteristics.

"Surface Hardening of Pearlitic Malleable Irons," by S. H. Bush, W. P. Wood, and F. B. Rote, University of Michigan, is the final report in a study of surface hardening characteristics of nine pearlitic malleable irons.

"Tenth Annual Report on the Investigation of Steel Sands at Elevated Temperatures," by R. G. Thorpe and Peter E. Kyle, Cornell University, Ithica, N. Y., and John P. Fraser, Shell Development Co., Emeryville, Calif.

Meetings of Interest to Foundrymen

June 4-6—French Foundry Association, foundry congress, Paris, France

June 11-13—Electric Metal Makers Guild, annual meeting, Seigniory Club, Montebello, Quebec

June 11-15—Conference on Industrial Research, Columbia University, New York

June 12-15—Institute of British Foundrymen, foundry congress, Newcastle-on-Tyne, England

June 18-22—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hotel, Atlantic City, N. J.

June 22-23—Malleable Founders' Society, annual meeting, the Homestead, Hot Springs, Va.

July 23-27—American Association for the Advancement of Science, research conference, New London, N. H.

July 27—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

July 30-Aug. 2—American Electroplaters' Society, convention, Statler Hotel, Buffalo

Sept. 10-14—International Foundry Congress, Brussels, Belgium

Sept. 10-14—Instrument Society of America, conference and exhibit, Sam Houston Coliseum, Houston, Tex.

Sept. 24-25—Steel Founders' Society of America, fall meeting, The Homestead, Hot Springs, Va.

Oct. 11-12—Michigan Regional Foundry Conference, Michigan State College, East Lansing, Mich., sponsored by Michigan chapters, AFS, and the college.

Oct. 15-19—American Society for Metals, annual meeting and exhibit, Michigan State Fair Grounds, Detroit

Oct. 19-20—Texas Regional Foundry Conference, Texas Chapter of the AFS, Shamrock Hotel, Houston, Tex.

Oct. 25-26—Gray Iron Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago

Oct. 31-Nov. 2—Foundry Equipment Manufacturers' Association, annual meeting. The Homestead, Hot Springs, Va.

Nov. 1-2—Metals Casting Conference, sponsored by Purdue University with Michiana and Central Indiana AFS chapters, Purdue University, West Lafayette, Ind.

Nov. 7-9—Meehanite Casting Manufacturers, annual meeting, the New Yorker, New York

Nov. 7-9—National Foundry Association, annual meeting, Shoreham Hotel, Washington

Nov. 8-10—Steel Founders' Society of America, Technical and Operating Conference, Carter Hotel, Cleveland

Nov. 15-16—Magnesium Association, annual meeting, Biltmore Hotel, New York

Dec. 6-8—American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Hotel William Penn, Pittsburgh

1952

Feb. 21-22—Birmingham Regional Foundry Conference, Birmingham District Chapter and University of Alabama Student Chapter of the AFS, Tutwiler Hotel, Birmingham

SPEEDMULLOR

The Speedmullor is today acknowledged as the accepted foundry sand mullor throughout the industry. Speedmullor mulling develops the maximum physical properties of molding or core sands in minimum time cycles . . . less than 90 seconds for most synthetic or natural sand mixtures. Speedmullor cooling is the only effective method of cooling hot sand during the mulling cycle. New Mulltrolmatic® automatic cycle controls take the variables out of sand preparation, and thus provide the ultimate in uniformity and control.

B&P

ETTER METHODS OF Sand Mulling BY BEARDSLEY & PIPER

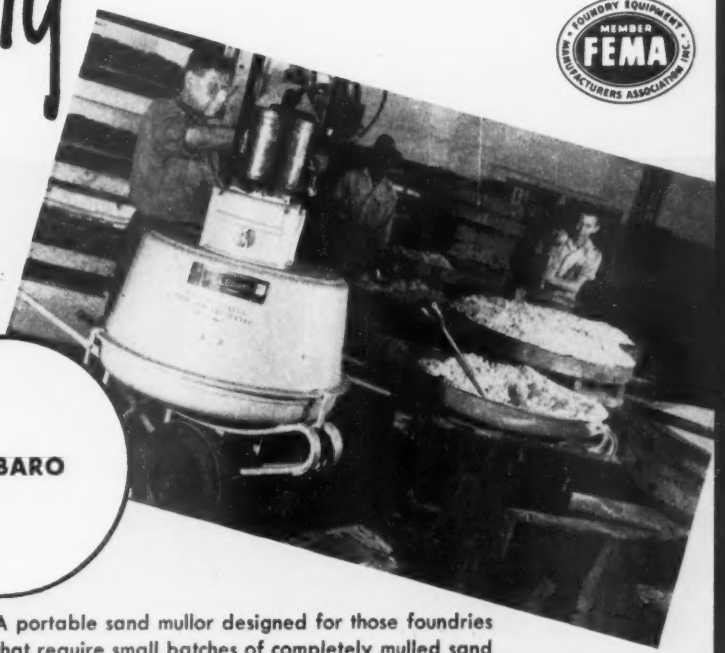
DIVISION OF PETTIBONE MULLIKEN CORPORATION
2424 N. Cicero Ave., Chicago 39, Illinois

WRITE FOR BULLETIN ON ANY OF THESE PRODUCTS!

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

LABORATORY MULBARO

Provides highly effective mulling of small special batches, or test batches of molding or core sand. This machine permits close laboratory control of sand preparation. Two or more mixing bowls may be used with one machine, providing a high degree of laboratory efficiency. With removable mulling bowl and pivot-mounted mulling mechanism, the Laboratory Mulbaro is extremely easy to clean.



MULBARO

A portable sand mullor designed for those foundries that require small batches of completely mulled sand for coremakers or molders located throughout the foundry. Because the sand is delivered to the molder or coremaker in the same barrows in which it is mulled, less sand handling is necessary, and several barrows may be used with one Mulbaro mulling mechanism.

AUTOMATIC SPEEDSLINGER

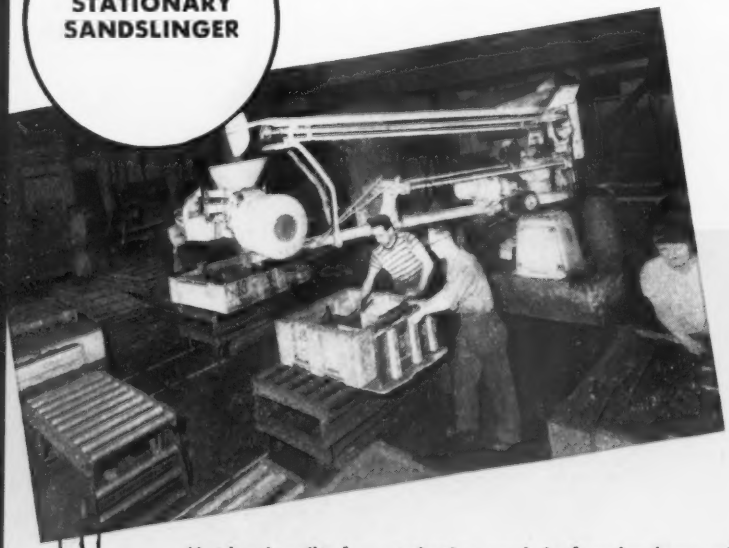
Brings the speed and truer-to-pattern ramming of the Speedslinger to those installations requiring the very highest molding rates from production pattern equipment. An electrically driven cam actuates the hydraulic mechanism which controls the movement of the ramming arms. Repetitive molds are rammed uniformly, accurately and automatically. Eight B&P Champion Speed-Draw Machines mounted on a B&P Turntable provide fast, accurate pattern-draw and facilitate the Speedslinger operation illustrated.

REMOTE CONTROL HYDRA-SLINGER

All the proven advantages of Sandslinger ramming plus added speed and convenience of remote hydraulic-con are combined in the Hydra-Slinger. The controls may positioned at any location adjacent to—or above—ramming area. Operator fatigue is eliminated, permit top efficiency throughout the shift. Truer-to-pattern m and higher quality—truer-to-dimension castings are tained consistently.

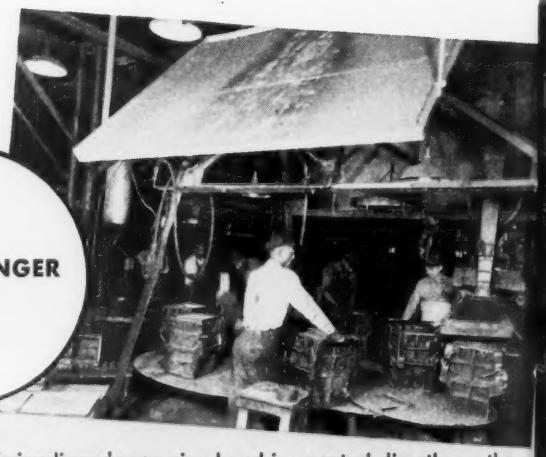
BETTER METHODS OF Ramming Molds

STATIONARY SANDSLINGER

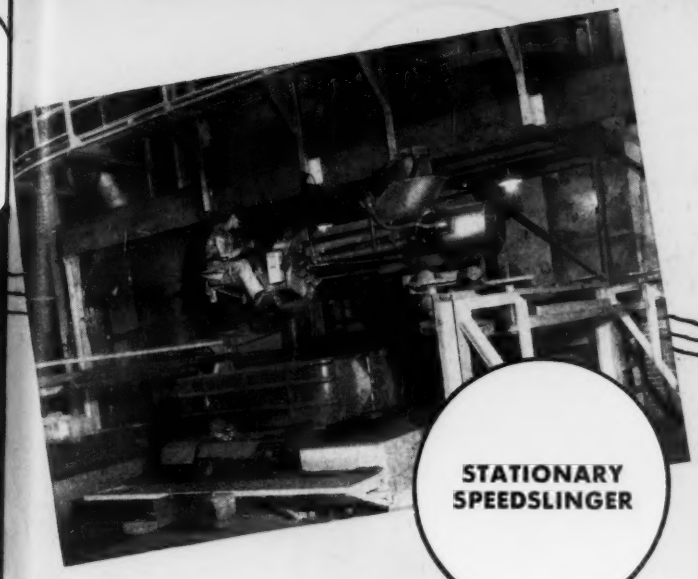


Used primarily for production work in foundry bays with sand conditioning systems. Its large ramming area permits the ramming of a wide range of molds and cores. The Sandslinger illustrated is ramming core boxes mounted on roller conveyor sections. The Sandslinger may also be used in conjunction with rollover-draw machines, transfer cars, power conveyors or molding turntables.

SWINGSLINGER

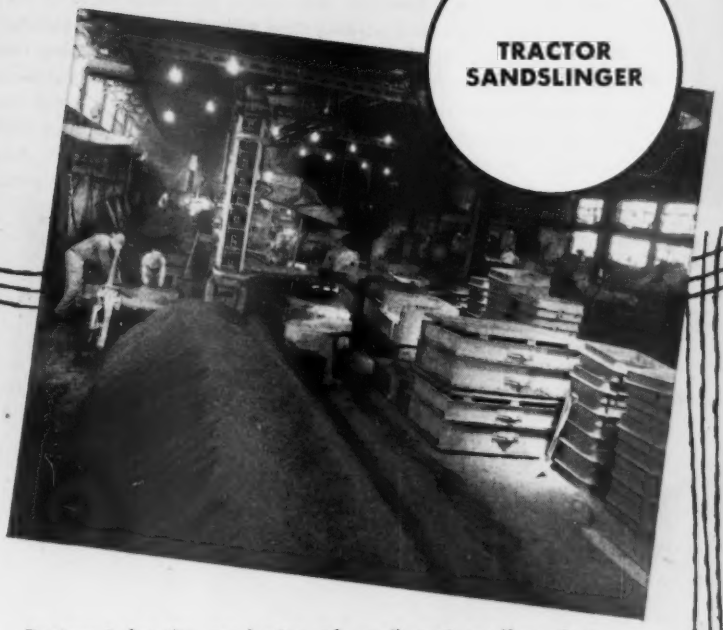


The Swingslinger's ramming head is mounted directly on the ramming motor to form one compact mechanism. This mechanism is suspended from a rugged steel frame and provided with sand by a plate feeder or sand supply belt. Provides a compact, high-production molding unit for the ramming of small or medium size patterns. Swingslinger ramming is most effective when applied to flasks or core boxes whose ramming requires no greater angular movement of the head than 6½ degrees from the vertical.



STATIONARY SPEEDSLINGER

Extends the advantages of Sandslinger ramming to those installations requiring greater capacity and range of operation than are available with the Sandslinger. The Speedslinger increases the capacity of the foundry in which it is installed and extends the size range of castings that may be profitably produced. A rugged hydraulic-control mechanism provides a high degree of ease and accuracy of operation. This machine's ramming speed facilitates the highest production per man-hour, and the highest production per square foot of floor space utilized.



TRACTOR SANDSLINGER

Designed for the production of small and medium size molds in foundry bays not served by auxiliary sand handling or conditioning systems. It loads and prepares its own sand, and is ideally suited for conditions where production is desired from a variety of patterns that may be mounted on pattern-draw machines and pulled along behind it. Shown above are two of four Tractor Sandslingers used in a large Midwest gray iron foundry.

...lond Cores BY BEARDSLEY & PIPER

DIVISION OF PETTIBONE MULLIKEN CORPORATION
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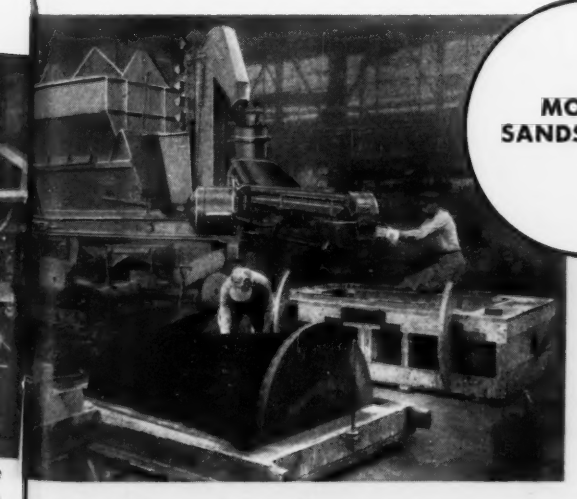
B&P



MOTIVE SANDSLINGER

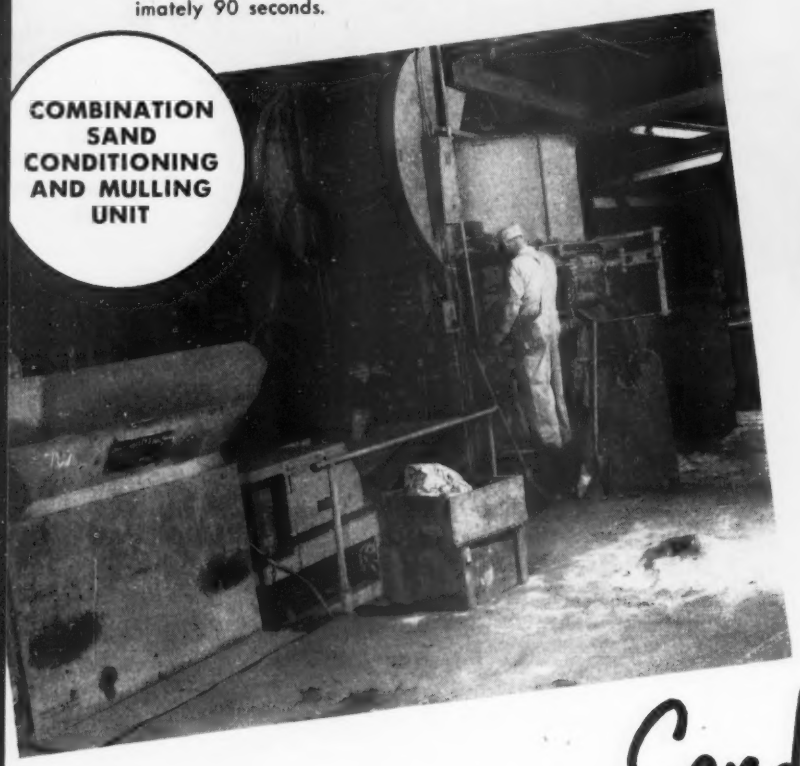
...e flexibility of the Sandslinger method of ramming is fully ...alized in a jobbing foundry when a Motive Sandslinger ...sed. Operates on tracks in the foundry and is able to ...m a very wide range of pit and flask work. Designed for ...se foundries where the size of pattern and flask equip-...nt makes it more practical to move the slinger to the ...sk, rather than the flask to the slinger.

MOTIVE SPEEDSLINGER

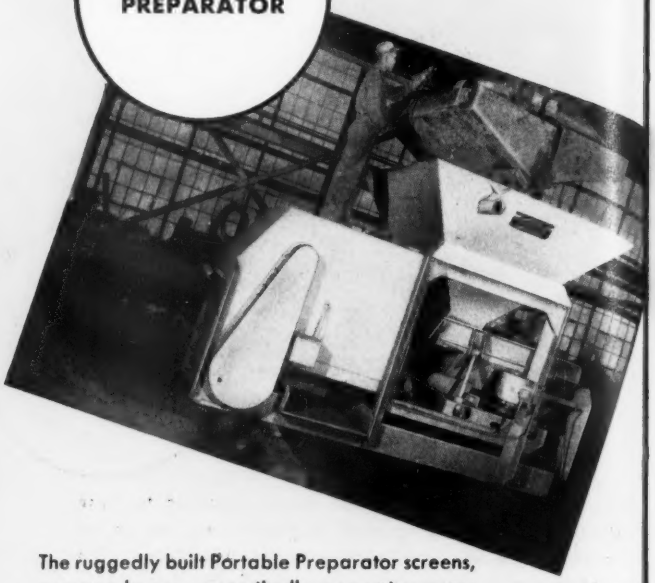
This machine has the largest ramming capacity and the greatest range of operation of any slinger. Handles the largest molds on a production basis, and yet provides the complete flexibility essential to successful jobbing foundry operation. Extends the foundry's range of operation and cuts ramming operations to a fraction of the time formerly required.

COMBINATION SAND CONDITIONING AND MULLING UNIT

Designed for those foundries that desire the advantages of fully mulled and conditioned molding sand without the outlay necessary for a complete sand system. Provides complete screening and magnetic separation and offers unequalled thoroughness of mulling. This combination unit provides the foundry with fluffier, more uniform molding sand that increases productivity and improves mold quality. The unit illustrated receives, completely conditions, fully mulls and discharges a one-ton batch of molding sand in approximately 90 seconds.



THE PORTABLE PREPARATOR



The ruggedly built Portable Preparator screens, removes lumps, magnetically separates scrap iron and shot, double aerates and adds moisture to the sand. Built to take the roughest treatment—all operating parts are protected by dust-tight enclosures. Lifting trunnions facilitate easy crane movement of the machine about the foundry.

BETTER METHODS OF Sand Conditioning BY BEARDSLEY & PIPER

DIVISION OF PETTIBONE MULLIKEN CORPORATION
2424 N. Cicero Ave., Chicago 39, Illinois

NITE-GANG

The newly developed Nite-Gang has proved itself under the toughest conditions. This self-propelled machine loads the sand to be prepared, completely blends it, magnetically removes scrap iron and shot, double aerates the sand, and discharges it into pile, windrow or bin.

B&P GYRATORY SCREEN

A compact unit that provides complete and thorough sand screening. Occupies very little space and yet provides an important element of dependability for any sand system. Its rugged construction insures long, trouble-free operation.

JUNIOR NITE-GANG

Provides the same thoroughness of conditioning as does the Nite-Gang, but is designed for use in conjunction with front-end loaders or other loading devices. Sand loaded into its bin is magnetically separated, screened and doubly aerated before discharge. The result is a completely uniform, fluffier, more easily workable molding sand.

SCREENARATOR

This lowest cost sand preparation unit is built in three models that provide capacities of 750, 1000 and 1500 pounds per minute of screened, double aerated and thoroughly blended molding sand.

WRITE FOR BULLETIN ON ANY OF THESE PRODUCTS!

Activities of Foundry

GROUPS

Chesapeake

PRINCIPAL speakers at the Apr. 27 meeting of Chesapeake Chapter of the AFS were Robert A. Colton, Federated Metals Division, American Smelting & Refining Co., and Dr. Carl Zapffe, consulting metallurgist, Baltimore. Their subject was "Reducing vs. Oxidizing Atmospheres for Bronze Melting."

Mr. Zapffe started the meeting with a discussion on how gases are included in metals and showed slides illustrating the advantages of degassing by using various atmospheres for different types of metals.

Mr. Colton discussed the chemistry of gases in metals as pertaining to bronze castings. He recommended melting under oxidizing conditions because when oxygen is high the hydrogen is low. As hydrogen is the recognized gas former, it is better to keep it on the low side. The speaker cited an English paper of some years ago in which the author recommended a certain amount of gas in the molten metal to disperse shrinkage. Mr. Colton stated it would be difficult to determine the exact amount of gas to prevent concentration of the shrinkage.—*William H. Baer, Naval Research Laboratory*

An Alumni group consisting of past and present officers of Chesapeake Chapter was formed during a dinner meeting called by E. W. Horlebein, Gibson & Kirk Co., Baltimore, on Apr. 17. All past chairmen of the chapter still in the area were present. The purpose of the group is to further the aims of the chapter by becoming an aggressive unit within the chapter. The meeting began with the reading of the minutes of the Chesapeake Chapter's first meeting which was held Nov. 15, 1940. Special guests were I. R. Wagner, Electric Steel Castings Co., Indianapolis, and R. E. Kennedy, representing AFS, and the technical speaker was Donald Reese, International Nickel Co. After a period of reminiscing and general discussion the meeting was adjourned.—*C. A. Robeck, Gibson & Kirk Co.*

Central Illinois

APPROXIMATELY 120 members and guests were present at the March meeting of Central Illinois Chapter of the AFS to welcome Walton Woody, national president, and W. W. Maloney, secretary-treasurer. Frank Shipley, a national director and a charter member of the chapter, introduced the guests after which each spoke briefly regarding society activities.

Guest speaker for the meeting was Frank Brewster, Harry W. Dietert Co., Detroit, who discussed "Sand Control." He asserted that the proper sand mixture is important in obtaining higher production, in making a better quality casting and in decreasing scrap. To emphasize these points, Mr. Brewster showed a number of charts and graphs showing results of experiments he has conducted.

The largest attendance of the current season was present during the Apr. 2 meeting of Central Illinois Chapter of the AFS held at American Legion Post No. 2 in Peoria, Ill. Featured were the showing and discussion of the film, "Fluid Flow in Transparent Molds," produced at Battelle Memorial Institute, under the sponsorship of the AFS Aluminum and Magnesium Division.—*Robert Paluska, Caterpillar Tractor Co.*

New England

THERE were 110 members and guests of the New England Foundrymen's Association present at the Apr. 11 meeting held at the Engineers Club, Boston. President, Robert Walker, Whitin Machine Co., Whitinsville, Mass., presided over a brief business meeting at which James A. Morrison, manager, Boston Convention Bureau, announced that a concerted effort would be made by that organization and the New England foundrymen to bring the annual convention of the AFS to Boston in

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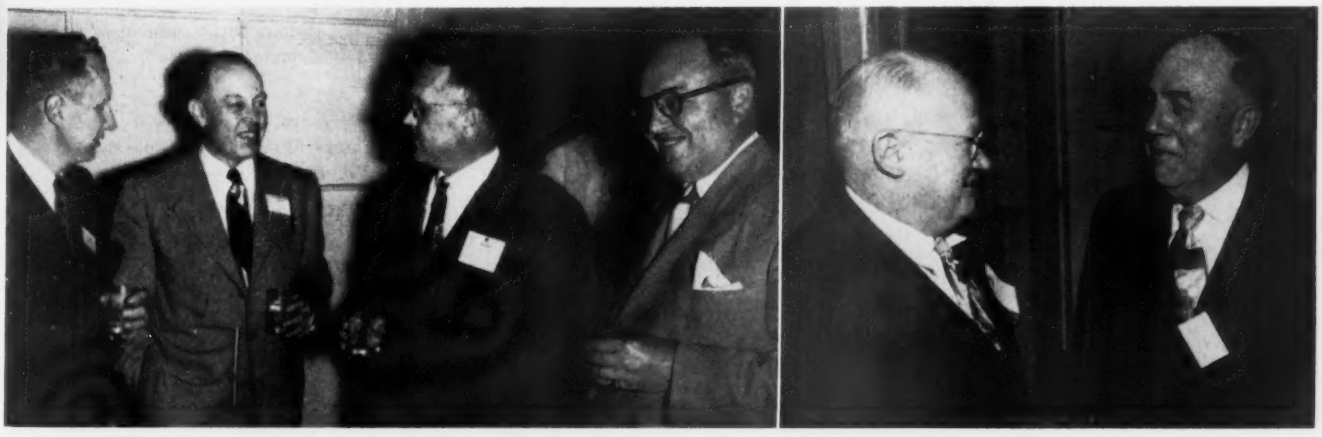
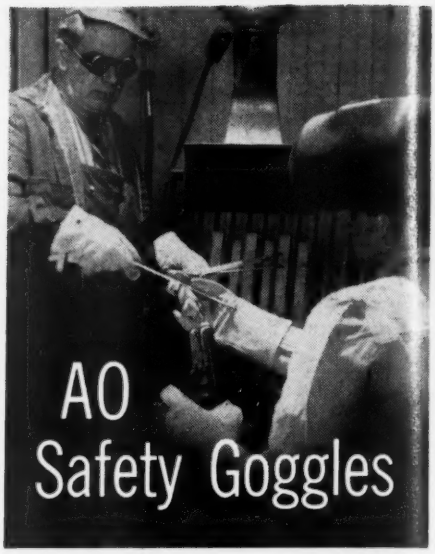


NORTHERN CALIFORNIA Chapter of the AFS held meetings on Mar. 16 and Apr. 20. View at left is from the March meeting and shows, left to right: James Rimmer, Columbia Steel Co.; Ralph Noah, San Francisco Iron Foundry; Art Klopf, Great Lakes Carbon Corp., and Joe Gitzen, Delta Oil Products Co., guest speaker. Shown at the April meeting at right, left to right, are Old Timers Bill Leishman, Pacific Brass Foundry of San Francisco Inc., and Eldo Finley, San Francisco Iron Foundry



Be Doubly Safe

from Glare and Impact Hazards with this **STREAMLINED WELDER'S GOGGLE!**

The 3081 goggle is one of AO's latest contributions to welders' safety and comfort. With Calobar lenses, it offers double protection for welders (under helmets), welders' helpers, furnace men, brazers, molders—anyone exposed to both impact and ray-glare hazards. With clear lenses, it is preferred by many for front and side protection against flying particles when chipping, grinding, riveting and spot welding. Features include handsome streamlined styling and light weight. Your nearest AO Safety Products Representative can supply you.

QUICK FACTS

BRIDGE—Sturdy cylinder bridge and reinforcing bar leather-covered to protect against heat, foreign bodies, stray light. 3 bridge sizes.

TEMPLES—On-center. Easily adjusted, perspiration proof and insulated with half tubing that will outlast temple. Dirt, grease can't discolor. Temples and endpiece screws, AO patented "Evertite."

ENDPIECE—Streamlined with wide bearing surface at hinge to minimize temple drop. Screw heads countersunk for non-sagging security.

SIDE SHIELDS—Soft leather type for utmost comfort and protection against lateral striking exposures.

LENSES—Super Armorplate or 6 Curve Super Armorplate Calobar. Medium, dark or extra dark. When injurious light or glare are not hazards, ask for clear Super Armorplate or clear 6 Curve Super Armorplate lenses.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

(*Continued from page* 185)

1955.

The meeting's technical speaker was Dr. Bruce S. Old, vice president, Arthur D. Little Inc., Cambridge, Mass., who presented an enlightening and descriptive talk on new features of blast furnace operation. The speaker reviewed briefly the history of blast furnaces, pointing out that with the exception of the size of equipment, little change in the method of producing pig iron has been made; however, recent improvements to blast furnace operation include increased top pressures and jet tapping.—*Myron DeHollander, General Electric Co.*

Detroit

TITLE of the Mar. 15 meeting of the Detroit AFS Chapter might appropriately have been "Old and New-Timers Night." Awards were made to the oldest patternmaker and to the man who has been an AFS member for the longest. Prizes were also awarded to winners of the apprentice patternmaking contest.

The oldest patternmaker in the audience was Fred W. Heiden, 76 years young, actively engaged in his trade for 57 years. He is with Ford Motor Co. The AFS member of longest standing was Claude B. Schneible of Claude B. Schneible Co., whose membership dates back 32 years.

The winning apprentices, introduced by Willard E. Kidwell, Packard Motor Car Co., were: Wood—Edward B. Young, Ford; James P. Hosey, Ford, and Charles Hands Jr., Century Pattern Works; Metal—Joseph E. Collins, Packard; Louis A. Conz, Cadillac, and Robert E. Bloch, Cadillac.

Featured speaker was L. H. Kinney, pattern engineer, Central Pattern Dept., Chrysler Corp., whose topic was "Modern Pattern Materials and Processes." Introduced by Vaughn C. Reid, City Pattern Foundry & Machine Co., the chapter vice chairman, Mr. Kinney described a number of new materials and methods which have been important cost savers to Chrysler.

EASTERN NEW YORK Chapter of the AFS held a joint meeting Apr. 10 with the local American Society for Metals chapter. Shown above at the meeting, left to right, are: Dr. Eckel, ASM chapter chairman; Charles Moriarty, General Electric Co., guest speaker, and L. M. Scully, AFS chapter chairman. Photo furnished by courtesy of George Danner, American Locomotive Co.

The question of how far a jobbing or semi-production foundry should go toward mechanizing was dealt with in the Apr. 19 AFS Detroit Chapter Meeting. Speaker was E. A. Swensson, National Engineering Co.

According to Mr. Swensson, this class of foundry can't afford to mechanize to the same extent as a production foundry and must be very careful in selecting and balancing its equipment. A danger to be avoided is "going whole hog" and being unable to stop once a program of mechanization is started. Progressive step-by-step mechanization is advised.

Keynote of jobbing-foundry mechanization, he said, must be maintenance of a high degree of flexibility. It is important that the amortization cost of such mechanization not be so high as to be a burden during periods of slow business.—*Howard C. Tuttle.*

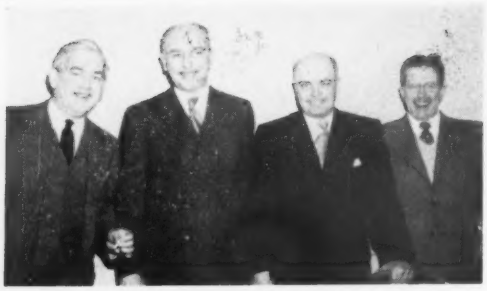
Northwestern Pennsylvania

ON Apr. 30, Donald LaVelle, research engineer, American Smelting & Refining Co., Barber, N. J. spoke before a group of approximately 100 members of Northwestern Pennsylvania Chapter of the AFS. His subject was "Aluminum Casting Defects and Their Corrections."

With the aid of slides, the speaker showed a varied assortment of aluminum casting defects. Some of the highlights of his talk were: Watch temperature closely; line ladle so as not to allow aluminum to pick up too much iron, over 1.2 per cent is detrimental to aluminum; gate properly; do not try to pour ring type castings with one gate; equalize pouring wherever possible; watch carefully for clay ball formation in sand heaps; be sure metal is thoroughly cleaned before melting; do not attempt to chill aluminum by adding scrap. Let it stand until correct pouring temperature is reached; every ladle of aluminum should be checked with pyrometer. James Farina, American Sterilizer Co., acted as discussion leader.

Chapter Chairman Frank Volgstadt, Griswold Mfg. Co., Erie, announced the following nominations for officers: Chairman, Douglas James, Cooper-Bessemer Co., Grove City, Pa.; vice chairman, Fred Carlson, Weil-McLain Co., Erie, Pa.; secretary, Bailey Herrington, Hickman, Williams Co., Erie, Pa.; treasurer, Clyde Cooper, Keystone Brass Co., Erie, Pa.

WESTERN NEW YORK Chapter of the AFS met at Hotel Sheraton, Buffalo, Mar. 2 to hear John B. Caine, foundry consultant, Wyoming, O., talk on "Gates and Risers." Photo by Marve Taublieb, Frederic B. Stevens Inc.



QUAD CITY Chapter of the AFS met Mar. 9. Shown at the meeting, left to right, are: William W. Maloney, national AFS secretary; S. C. Massari, national AFS technical director; H. A. Rasmussen, General Pattern Corp., Moline, Ill., chapter chairman, and Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill.

Directors nominated are: Frank Volgstadt, Griswold Mfg. Co., Erie; Roy A. Loder, Erie Malleable Iron Co., Erie; Jake Diemert, Erie Castings Co., Erie; Theodore Fritts, National Erie Co., and David Fourspring, Read Standard Co., Erie.

The chapter's annual picnic will be held Saturday, June 23 at Erie. Charles Bon, National Bearing Division, American Brake Shoe Co., is chairman and Fred Carlson, Weil-McLain Co., vice chairman.—*Earl Strick, Erie Malleable Iron Co.*

Twin City

REGULAR meeting of Twin City Chapter of the AFS was held Apr. 10 at the Midway Club, St. Paul. The following officers and directors were elected for the coming year: Chairman, C. Fred Quest, J. F. Quest Foundry Co., Minneapolis; vice chairman, J. M. Costello, pattern supervisor, American Hoist & Derrick Co., St. Paul; secretary-treasurer, Lillian K. Polzin, Minneapolis Chamber of Commerce. Directors elected to serve three years: Phillips E. Gustafson, foundry superintendent, St. Paul Foundry & Mfg. Co., St. Paul; Lloyd H. King, president, King Foundry Co., St. Louis Park, Minn.; Leo M. Malis, foundry superintendent, Crown Iron Works Co., Minneapolis.

Main speaker was B. C. Yearley, assistant manager, National Malleable & Steel Castings Co., Cicero, Ill., whose talk was entitled, "Gating and Heading." The speaker declared that casting feeding problems boil down to heat transfer principles or getting the heat away from the casting in an orderly manner to aid directional solidification. Further, he stated in his experience he has found that the elimination of casting dirt usually corrected casting blow conditions.

In conclusion, the color motion picture, "This Moving World," produced by the Malleable Founders' Society, was presented.—*J. D. Johnson, Archer-Daniels-Midland Co.*

Wisconsin

SECTIONAL discussion groups featured the Apr. 13 meeting of Wisconsin Chapter of the AFS at Hotel Schroeder, Milwaukee. After dinner the nonferrous group had Donald LaVelle, Central Research Laboratory, American Smelting & Refining Co., Barber, N. J., as speaker. His talk was entitled "Making Better Test Bars." C. Van Buren, Allis-Chalmers Mfg. Co., acted as chairman.

The steel group heard a talk on "Homogenization of Cast Steel," by Prof. P. C. Rosenthal, University of Wisconsin, Madison. Chairman was C. Fuerst, Falk Corp., Milwaukee.

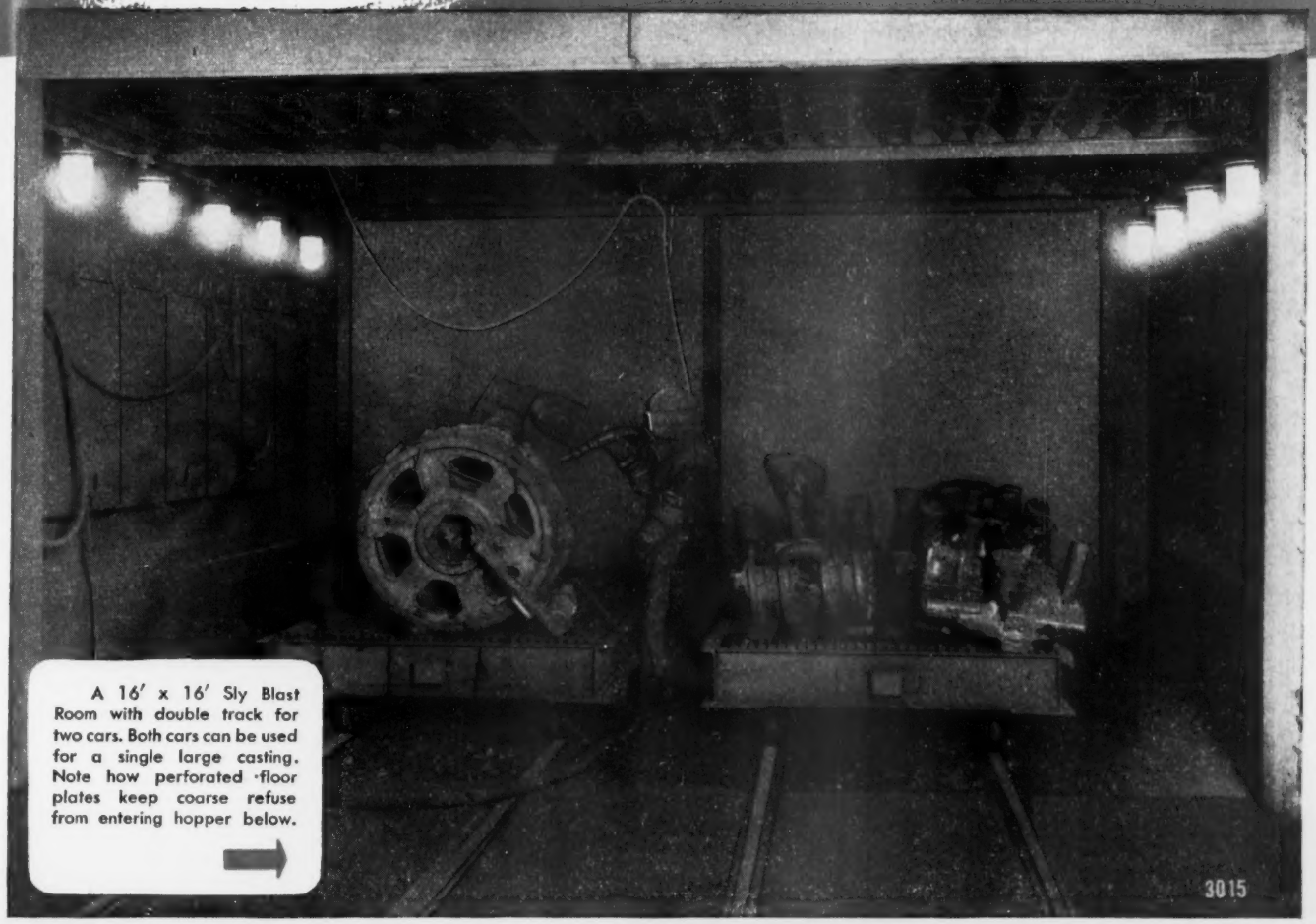
R. E. Savage, International Nickel Co. Inc., New York talked on "Current Status of Alloys and Ductile Cast Iron," before the gray iron group at which A. R. Janes Jr., Standard Foundry Co., Racine, Wis., acted as chairman.

"Modern Molding Methods" was the subject of a talk delivered by J. S.

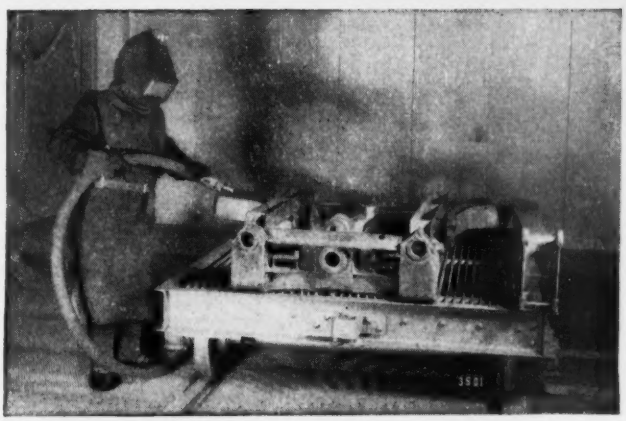
(*Continued on page* 190)

CENTRAL INDIANA: At the chapter's Mar. 5 meeting shown at top, left to right, are: Fred Kurtz, chapter secretary; Lee Edwards, membership chairman; Robert Spurgin III, vice chairman; Allen Reid, chairman; Gordon Johnson, Armour Research Foundation, speaker at the meeting; G. C. Dickey, technical chairman; William Ziegelmueller, director, and Ray Fickenworth, treasurer. Lower view was taken at the Feb. 5 meeting. Left to right, are: Allen Reid, chairman; Martin J. O'Brien Jr., national AFS director; William W. Maloney, national AFS secretary; Richard Bancroft, past chapter chairman, and I. R. Wagner, first chapter chairman. Photos by H. Yeager, International Harvester Co.

SLY ARMOURED* BLAST ROOMS



A 16′ x 16′ Sly Blast Room with double track for two cars. Both cars can be used for a single large casting. Note how perforated floor plates keep coarse refuse from entering hopper below.



This view shows a Sly Blast Car in a Sly Blast Room. Perforated floor plates are supported by grating preventing plates from warping. Observe how tops of rails are flush with floor. Operator wears a Sly "Purair" Helmet.

Whatever Size Your Castings

And whatever your tonnage we have a standard blast room to suit. W have built blast room equipment for the cleaning of the inside of ta cars, for large airplane fuselages, for structural assemblies, tanks, railroc cars and locomotives. Some large blast rooms are self-contained buildinç

Standard Sly Blast Rooms

Inside Width: 8 ft., 10 ft., 12 ft., 14 ft., 16 ft.
Inside Length: 8 ft., 10 ft., 12 ft., 14 ft., 16 ft.
Inside Height: 7 ft. 3 in., 8 ft. 3 in., 9 ft. 3 in.
Larger Blast Rooms for special purposes.

***ARMOURED** — **An extra layer of detachable 3/16″ steel wear plates to protect the walls.**
An extra layer of steel grating to reinforce the floor against sagging.
(Exclusive Sly features)

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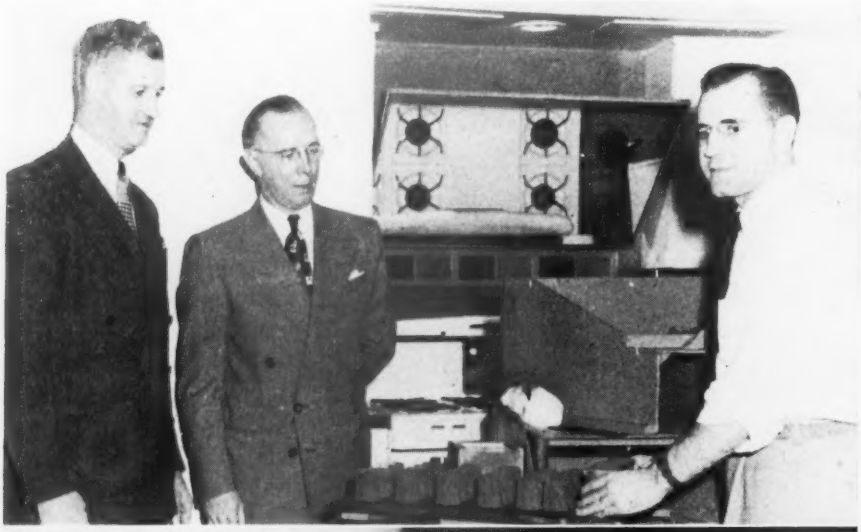
(*Continued from page* 188)
Parker, SPO Inc., Cleveland, before a joint meeting of the malleable iron and pattern groups. R. N. Schaper, Wisconsin Appleton Co., South Milwaukee, Wis., was chairman.—*John E. Hubel*

Ontario

A DISCUSSION of "Fundamental Aspects of Foundry Molding Sand and Its Effect On Certain Metal Alloys," by C. A. Sanders, vice president, American Colloid Co., Chicago, was featured at the Mar. 30 meeting of Ontario Chapter of the AFS.

Mr. Sanders explained that some recent investigations at Michigan State College, East Lansing, Mich., verified previous investigations that too little attention was given the effect of molding sand and its relationship to "apparent metal shrinkage." A movie and slides were shown illustrating that by varying sand mixtures, various degrees of "apparent metal shrinkage" could be obtained.

Much metal shrinkage is due to the movement of the mold-metal interface, which generally results in oversized castings and which metallurgy cannot correct. For example, gray iron is said to have less metal shrinkage if the carbon equivalent is high, than when the carbon equivalent is low. Regardless of how high the carbon equivalent is, if there is a movement of the mold-metal interface which allows an oversized casting, "apparent metal shrinkage" can result and can only be corrected by changing molding procedures and molding sand mixtures.—*O. A. Davies, General Smelting Co. of Canada Ltd.*



LECTURE COURSE: Chicago Chapter of the AFS sponsored a foundry practice and demonstration course from Jan. 8 to Apr. 9. At top left to right, are: H. G. Haines, Howard Foundry Co., course chairman, and S. D. Martin and Charles Druery, Danville plant, General Motors Corp., who demonstrated motion study and better methods at one of the sessions. At bottom, left to right are: William W. Maloney, national AFS secretary; C. V. Nass, Pettibone Mulliken Corp., chapter chairman, and D. A. Farrel, U. S. Steel Corp., who addresed one of the sessions on safety. Photos courtesy of I. H. Dennen, Beardsley & Piper Division, Pettibone Mulliken Corp.

TENNESSEE Chapter of the AFS heard Paul Arnold, resident manager, U. S. Pipe & Foundry Co., Chattanooga, Tenn., speak at its Mar. 23 meeting

Metropolitan Brass Founders

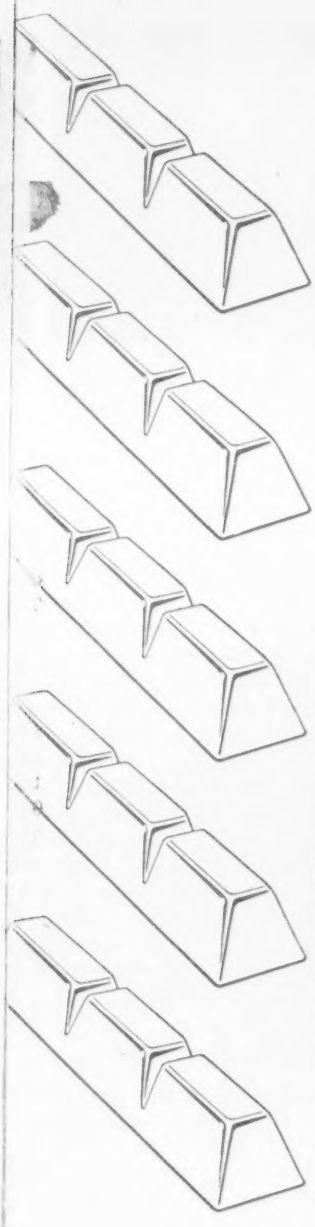
CELEBRATION of the 41st anniversary of Metropolitan Brass Founders Association was held Apr. 6 with a floor show and dance at Hotel New Yorker. There were 20[illegible] members and guests present. Eugene Fiamma, World Brass Foundry Co., and president of the association, presented William E. Leary with a $200 savings bond in appreciation of his services as executive secretary from October, 1949 to January, 1951 when he resigned to join Wright Aeronautical Corp., Woodridge, N. J. Patrick Halloran, Halloran's Brass Foundry Inc., and chairman of the entertainment committee, and also a past president of the association, introduced three association past presidents who were present: George Staub, past president of American Marine Brass Foundry Inc.; J. H. Sorensen, Columbus Foundry Co., and Rudolf Ripple, Sunnyside Bronze Foundry Inc.—*George Staub, executive secretary*

Connecticut Non-Ferrous

A DISCUSSION of "Government Controls and How They Affect Industry," was presented by Sidney Fish, *Journal of Commerce*, Jersey City, N. J., at the Mar. 21 meeting of the Connecticut Non-Ferrous Foundrymen's Association held at Castle Restaurant, New Haven, Conn.

He stated that government controls should be looked on as a long-range program and in all probability will be with us for the next three years. Business will have its tough and easy periods, depending on the general world conditions. Mr. Fish pointed out there are different problems now than during the last war. Business condi-

(*Continued on page* 192)



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PHILADELPHIA: Douglas James, Cooper-Bessemer Corp., Grove City, Pa., (above) discussed nodular iron at the chapter's Apr. 13 meeting. Photo by courtesy of William Mooney, Dodge Steel Co., Philadelphia

(*Continued from page* 190)

tions are different in that we are working on a 7 per cent war basis which should reach about 20 per cent next year, whereas during World War II we were operating on an 80 per cent war basis.

At present industry is working on the 5 and 10 system of pricing. They are allowed to raise prices 5 per cent above Jan. 31 price or 10 per cent above pre-Korea. However, business is taking steps to counteract this price arrangement but in order to readily get price relief, operating costs must be known.—*William R. Slater*

Western New York

ONE of the largest attendances of the year was present at the Apr. 6 meeting of Western New York Chapter of the AFS held at Hotel Sheraton, Buffalo. Dr. J. A. Ridderhof, Frederic B. Stevens Inc., spoke on "Core and Mold Coatings."

The speaker emphasized that washes and coatings are not cures for poor cores or molds. They will aid the operation of a good mold but cannot overcome the defects of a poor one. Further, washes affect only the sand surface, penetrating no more than from two to five sand grains beyond the surface.

Selection of the proper core or mold wash for a particular job must be based on the actual purpose of such materials: First, to prevent fusing of sand to casting surface; second, to stop penetrating of metal into the sand; third, to insure a smoother casting surface. Attention must be paid, he stated, to the thickness of the metal section, remembering the heat-retaining qualities of the thicker and heavier sections.

Erwin Deutschlander, Worthington Pump Co., vice chairman of the chapter, presided and Marve Taublieb, Frederic B. Stevens Inc., served as

technical chairman of the meeting.

First and second place winners, respectively, in the chapter's apprentice contest are: Wood pattern, Gene Busch, Worthington Pump & Machinery Corp., Buffalo, and Robert Gross, Worthington Pump & Machinery Corp., Buffalo; ferrous molding, Casimer F. Ogledzinzki, Symington-Gould Corp., Depew, N. Y., and Philip Schneider, Standard Buffalo Foundry, Lancaster, N. Y.; nonferrous molding, John Klym, Lakeside Bronze Inc., Buffalo, and Carlton Metzloff, Lakeside Bronze Inc., Tonawanda, N. Y. —*Marve Taublieb, Frederic B. Stevens Inc.*

Chicago

MEMBERS of the Chicago Chapter, AFS, who attended the Apr. 2 meeting at the Chicago Bar Association should have not only a keener appreciation of the American way of life but should henceforth be vocal and aggressive in preserving it.

Kenneth W. Haagensen, director of public relations, Allis-Chalmers Mfg. Co., Milwaukee, in a powerful yet entertaining manner emphasized how our system is being jeopardized and freedoms encroached upon by our passive attitudes. He urged that every individual and every industrial management become salesmen for our most important and prized product—democracy.

Members of the newly chartered Northwestern University Student Chapter, AFS, and its faculty advisors were guests of the Chicago Chapter at the latter's final meeting of the current season, May 7, at the Chicago Bar Association. Almost 200 were present for the occasion, which also featured the annual business meeting and four roundtable sessions.

Chicago Chapter President C. V.

METROPOLITAN Chapter of the AFS heard Earl E. Woodliff, sand consultant, Detroit, (left) discuss sand control at its Apr. 2 meeting. Technical Chairman Robert J. Maddison, Whitehead Brothers Co., is at right. Photo by John Bing, Metropolitan Refractories Corp., New York

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Then give HERC-ALLOY the toughest chain job in your plant. Our asking for this test reflects the confidence given us by HERC-ALLOY service records from industry's leading plants.
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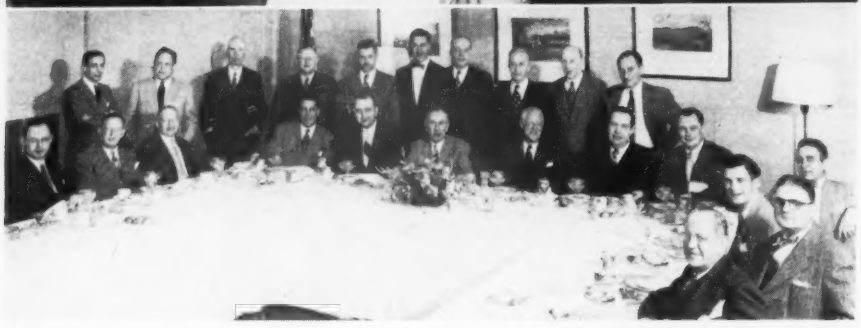


NATIONAL FOUNDRY ASSOCIATION held a regional meeting Mar. 5 at the Cincinnati Club. R. J. Redmond, Buckeye Foundry Co., Cincinnati, area chairman, presided. L. E. Roark, executive vice president, and Fred A. Hartley, Washington representative, were speakers. View of that meeting is shown at top. Bottom view is of a similar meeting in the Cleveland area at Hotel Cleveland. K. Davidson, Taylor & Boggis Foundry Co., Cleveland, area chairman, presided. Martin J. Ewald, NFA regional counsel, Mr. Roark and Mr. Hartley spoke

Nass, vice president, Pettibone Mulliken Corp., welcomed the Northwestern student chapter, pledged co-operation with it and introduced its chairman, A. Putnam Volkmar, and the two faculty advisors, Prof. Donald H. Whitmore and Willis T. Chandler, foundry instructor. Mr. Chandler and Mr. Volkmar spoke briefly, the latter introducing other officers and members of the student group.

Officers for 1951-52, proposed by the nominating committee at the April meeting, were elected and installed.

Walter W. Moore, works manager, Burnside Steel Foundry Co., who served last year as vice president and program committee chairman, is the new president. New vice president is John H. Owen, Chicago district sales manager, Harbison-Walker Refractories Co. Robert L. Doelman, sales department, Miller & Co., was named secretary of the chapter.

New directors elected are: Walter Balton, foundry superintendent, Link-Belt Co.; Frank B. Flynn, sales manager, S. Obermayer Co.; and Harold G. Haines, Semisteel Division, Howard Foundry Co.

"Advanced Design of Pattern and Core Box Equipment for Production Foundries" was the discussion subject for the joint roundtable of the Nonferrous and Pattern Divisions. Richard Ligocki, supervisor of pattern department, Hammond Brass Works, Hammond, Ind., was the speaker, and Fred L. Riddell, foundry metallurgist, H. Cramer & Co., was chairman.

The Steel Division considered "Successful Gating and Risering Techniques" with Sam Belus, supervisor of inspection, Burnside Steel Foundry Co., John Barney, foundry engineer, National Malleable & Steel Castings Co., and William Wick, sand and refractory engineer, Pettibone Mulliken Corp., as speakers. Robert P. Schauss, foundry engineer, Illinois Clay Products Co., was chairman.

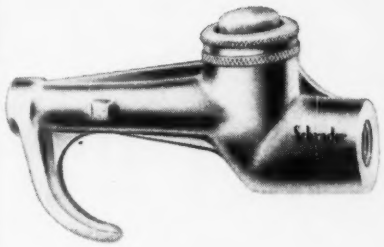
Harold G. Haines, metallurgist, Semisteel Division, Howard Foundry Co., addressed the Gray Iron Division Roundtable on "Analysis and Specifications Per Casting Section." Chairman was Leroy E. Taylor, service engineer, Goebig Mineral Supply Co.

Malleable Division, under chairmanship of "Chief Surgeon" Robert E. McCluskey, finishing superintendent, Cicero Works, National Malleable & Steel Castings Co., conducted a clinic on "Finishing and Quality Control." The consulting staff comprised "Doc-

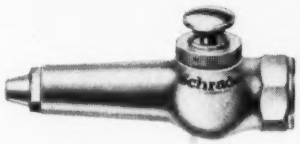
(*Continued on page* 197)

SOUTHERN CALIFORNIA Chapter of the AFS on Apr. 13 heard E. V. Sumner, Federated Metals Division, American Smelting & Refining Co., Los Angeles, speak on the alloying of copper-base alloys. Shown at the meeting at left, left to right, are: Charles J. Hofschroer, Kay Brunner Steel Products Inc., local patternmaking contest winner who later took national honors, and Earle D. Shomaker, Kay Brunner Steel Products, Inc. At bottom, left to right, are: John Wilson, Climax Molybdenum Co., chapter president; Mr. Sumner; Glen V. Ballard, Federated Metals Division, American Smelting & Refining Co.; and a conversational group. Photos by K. F. Sheckler, Calmo Engineering Co.

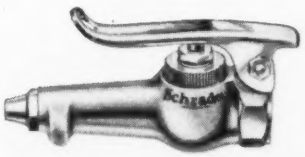
There is a Schrader® blow gun for every job



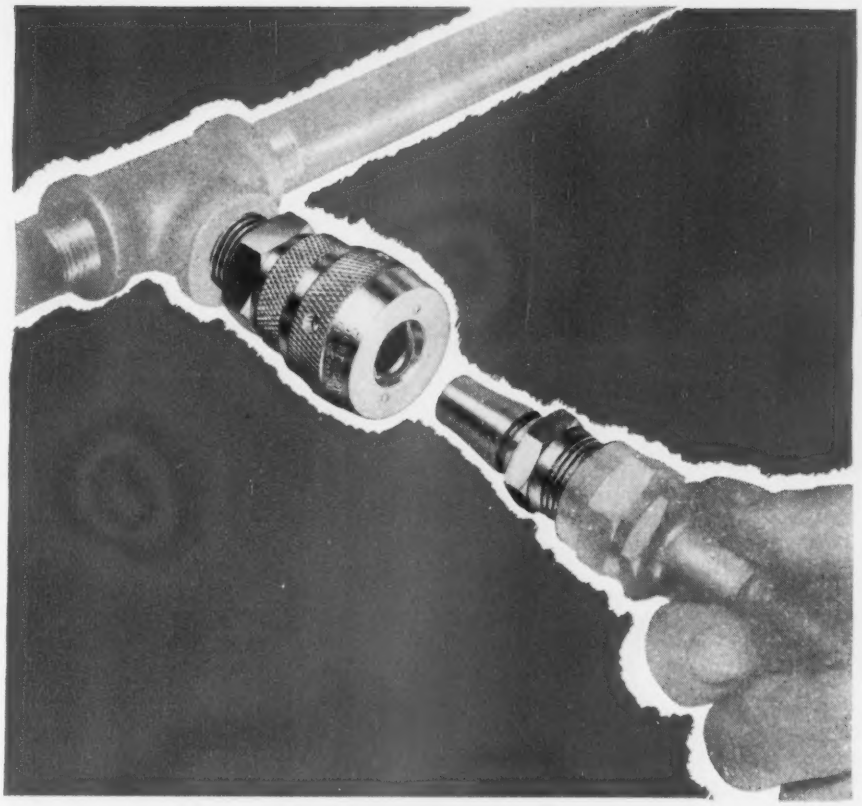
This drop forged stainless steel blow gun is designed to stand up under hard, steady use. It is practically indestructible. The stainless steel construction increases corrosion resistance and gives you a positive guarantee of longer, trouble-free service.



Button Type—This sturdy all-purpose forged brass blow gun operates at the press of a button. A popular all-round blow gun that has proved indispensable to hundreds of thousands of users.



Lever Type—A controlled flow of air, from a puff to a blast, is a feature of this precision-control blow gun. Its design and lever position provides a natural grip for thumb control of air flow.



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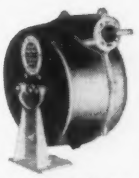
The Schrader Tuck-Away Hose Reel is another item for more convenient



handling of compressed air. This reel will keep air lines off the floor, reduce accidents, lengthen the life of the hose. Schrader Hose Reels are the efficient way to bring air to the work.

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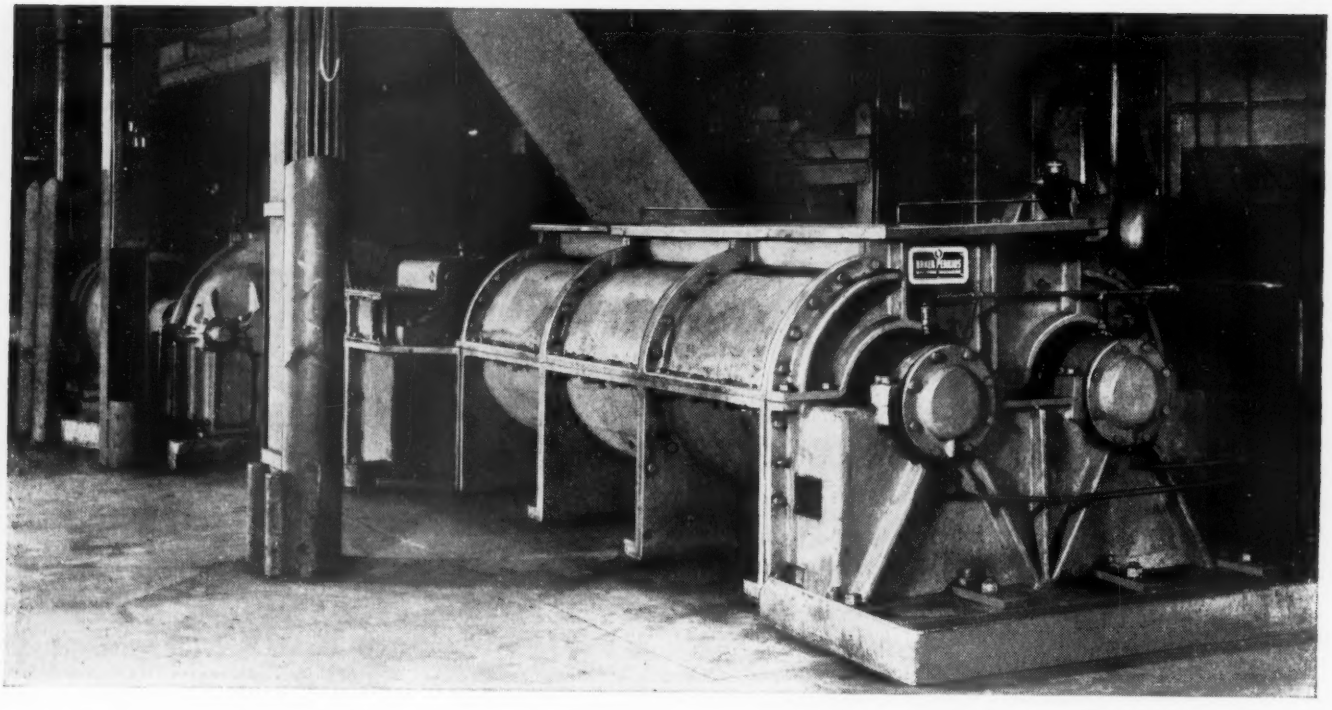
PRODUCTS
CONTROL THE AIR

17,280 TONS

OF MOLDING SAND PER 3-SHIFT DAY

processed by Baker Perkins mullers in world's biggest grey iron foundry



Six Baker Perkins Continuous Mullers are on the job at the world's biggest grey iron foundry helping to meet tough, tight schedules that depend on high daily production. Each B-P 5A Muller is conditioning 120 tons of molding sand each hour during an 8-hour shift. In the course of a 3-shift day, the six B-P Mullers handle the staggering total of 17,280 tons of sand that comes to the molding lines thoroughly mixed and tempered. Baker Perkins Continuous Mixers are ideal for processing molding sand on a big scale. Unique blade arrangement in B-P Mullers thoroughly mulls and aerates the tumbling sand mass, and each grain of sand is correctly coated with bond. B-P Mullers will deliver an uninterrupted flow of 30 to 120 tons of good sand per hour depending upon the size unit. Baker Perkins Continuous Mullers produce improved sands that mean better castings and lower scrap loss. They dependably meet the demands of high production automotive foundries and they can do the same for you. Write, wire, or phone for the full story on Baker Perkins Continuous Mullers.

BAKER PERKINS INC.

SAGINAW, MICHIGAN

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(*Continued from page* 194)

tors" Anthony Raiman, chief inspector, Illinois Malleable Iron Co.; Albert Frieberg, superintendent, Malleable Foundry, International Harvester Co.; L. K. Hooper, assistant manager of inspection, Crane Co.; and James D. Frasier Jr., quality control director, Cicero Works, National Malleable & Steel Castings Co.—*Erle F. Ross.*

Eastern New York

A JOINT meeting of the local chapter of American Society for Metals and Eastern New York Chapter of the AFS was held Apr. 10 at Circle Inn., Lathams, N. Y. The speaker was Charles Moriarty, whose talk was on "Nondestructive Testing of Materials." Mr. Moriarty heads the nondestructive testing department, General Electric Co., Schenectady works, and holds the Coffin award for the design and use of industrial x-ray equipment.

The nominating committee presented the following slate for the coming year: Chairman, John E. Waugh, General Electric Co., Schenectady, N. Y.; vice chairman, Leigh Townley, Adirondack Foundries & Steel Inc., Watervliet, N. Y.; secretary-treasurer, E. S. Lawrence, General Electric Co., Foundry Division. Directors for three years: Lyman C. Thunfors, Rensselaer Valve Co.; Cliff Apgar, Adirondack Foundries & Steel Inc.; Jasper Wheeler, Wheeler Bros. Foundry.

Leo M. Scully, Scully Foundry & Machine Co., Coxsackie, N. Y., and chairman of the chapter, expressed the hope that joint meetings with the ASM group would become an annual affair.—*George E. Danner, American Locomotive Co.*

New Jersey

PRONOUNCED shortage of pig iron was revealed by foundrymen attending the New Jersey Foundrymen's meeting at the Military Park Hotel, Apr. 16. Various foundrymen reported production as being limited to five days a week, whereas they had sufficient business on hand to warrant higher operation, and were concerned over the possibility of a further limitation. Some shops had only sufficient iron to last them for a few days. Scrap was tight but not necessarily critical. An increasing shortage was noted in ferroalloys.

Proposed changes in the New Jersey Workmen's Compensation law in regard to silicosis were discussed by Theodore C. Waters, Baltimore attorney, and George C. Meredith, attorney, New Jersey Manufacturers Association.—*Ben K. Price.*

Washington

MARCH meeting of Washington Chapter of the AFS was held at Gowman Hotel, Seattle.

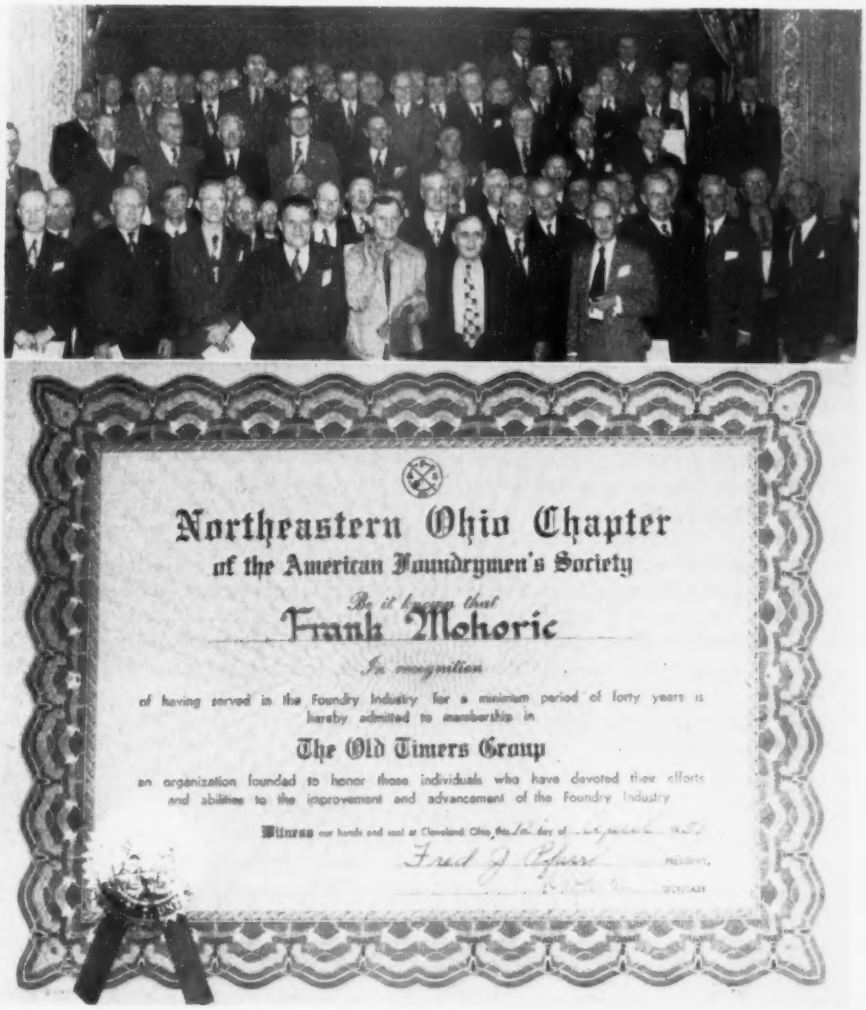
Prof. William Snyder presented a coffee talk in which he discussed the use of olivine sands at the University of Washington (May FOUNDRY, p. 104).

Joseph Gitzen, president, Delta Oil Products Co., Milwaukee, was the meeting's principal speaker. His subject was "What Causes Core Failures?" He pointed out the four primary factors controlling core properties are: Sand, binders, water and baking. Mr. Gitzen discussed the merits and drawbacks of liquid and dry binders used in the coreroom today. Core oil and linseed oil, claimed Mr. Gitzen, are the two most used and abused constitutents of cores. They cause, along with water, the most core failures. Water is most abused—too much causes scabbing, sticking and penetration. High moisture makes for high skin hardness in cores. Bake your cores in the core oven and not in the mold, Mr. Gitzen admonished. Core failures, he said, are most often attributable to underbaked cores or undried core wash.—*Harold R. Wolfer, Puget Sound Naval Shipyard*

Northern California

THE subject of cores and their manufacture was discussed by Joseph A. Gitzen, president, Delta Oil Products Co., Milwaukee, at the Mar. 16 meeting of Northern California Chapter of the AFS. The meeting was held at the Hotel Shattuck, Berkeley. Mr. Gitzen devoted the greater part of his talk to the failings of various types of cores and core materials. An extensive discussion period followed the lecture.

"Fundamentals of Nonferrous Melt-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of the American Foundrymen's Society
Be it known that
Frank Mohoric
In recognition
of having served in the Foundry Industry for a minimum period of forty years is hereby admitted to membership in
The Old Timers Group
an organization founded to honor those individuals who have devoted their efforts and abilities to the improvement and advancement of the Foundry Industry
Witness our hands and seal at Cleveland, Ohio, this 1st day of
Fred J. Oliver

NORTHEASTERN OHIO Chapter of the AFS issued certificates to foundrymen in the chapter area, having 40 or more years of service in the industry. Presentation was made at the chapter's April 12 meeting. The certificate shown above is inscribed with the name of Frank Mohoric, who has been with Lake City Malleable Co., Cleveland, and its predecessor company for 57 years. He is still employed as a molder. Top view shows most of the old timers present at the meeting. Photos by Tom Gallagher, Lake City Malleable Co.

WESTERN MICHIGAN Chapter of the AFS met Apr. 2 at Cottage Inn, Muskegon, Mich., to hear two speakers—R. A. Colton and Donald LaVelle, American Smelting & Refining Co. Shown at left above, left to right, are: Mr. Colton; Ross Shaffer, Lakey Foundry & Machine Co., chapter vice chairman, and Mr. LaVelle. At right, left to right, are: Paul Johnson, Grand Haven Brass Foundry; J. O. Ostergren, Lakey Foundry & Machine Co.; Walter L. Seelbach, national AFS president-elect; Robert DeVare, Lakey Foundry & Machine Co., and Stanley Davis, Campbell, Wyant & Cannon Foundry Co., chapter chairman

ing" was the title of the talk by George Dalbey, metallurgist, Mare Island Naval Shipyard, Mare Island, Calif., at the chapter's April dinner meeting. A forum discussion followed with Don Caudron, Pacific Brass Foundry, San Francisco, acting as moderator and the panel including Robert Johnston, General Metals Corp., Metals Division, Oakland; George Stewart, East Bay Brass Foundry, Richmond, Calif.; Robert C. Caldwell, Federated Metals Division, American Smelting & Refining Co., San Francisco; and Norman Barnett, M. Greenberg's Sons, San Francisco.

Announcement was made of the nominations to chapter offices for the coming year: President and chapter chairman, Philip C. Rodger, General Metals Corp., vice president and program chairman, George W. Stewart, East Bay Brass Foundry; secretary, Davis Taylor, American Wheelabrator & Equipment Co., and treasurer, Fred A. Mainzer, Pacific Brass Foundry of San Francisco. Retiring Chairman John Russo, Russo Foundry Equipment Co., will act in an advisory capacity to the board of directors. New directors nominated for two years are: Norman Schlegal, Waterman Industries, Exeter; George Dalbey, Mare Island Navy Yard, Mare Island; Dick Nelson, Pacific Steel Castings Co., Berkeley; and Angelo Castagnola, A.B.C. Pattern Works, Oakland.—*J. M. Snyder, Jos. Musto Sons-Keenan Co.*

Nonferrous Founders Hold Annual Meeting

ANNUAL meeting of the Non-Ferrous Founders' Society was held in Buffalo, Apr. 22. The following officers were re-elected to serve during 1951-52: President, J. D. Zaiser, Ampco Metal Inc., Milwaukee; first vice president, L. H. Durdin, Dixie Bronze Co. Inc., Birmingham; second vice president, Robert Langsenkamp, Langsenkamp - Wheeler Brass Works Inc., Indianapolis. Directors elected for three years are: Walter M. Clark, South Boston, Mass.; Walter V. Storm, Los Angeles; Herbert E. Eggerts, Berkeley, Calif.; H. A. White, Chicago; E. T. Korten, Cincinnati.

A complete report on activities of the society in Washington was made by J. D. Zaiser, chairman of the Washington activities committee. He stated that the organization is continuing its efforts to have the present M-12 order relaxed until the new Controlled Materials Plan is put into effect in the near future.

It was announced that the society has been offered an honorary membership in the Brass and Bronze Founders of England, and in accepting the membership, a resolution was passed extending an honorary membership in the Non-Ferrous Founders' Society to the English organization.

Following the business meeting, Seymour Maisel, attorney with the New York Regional Office of the U. S. Department of Labor, New York, spoke on orders issued by the Wage Stabilization Board of the Economic Stabilization Agency. Mr. Maisel reviewed these orders, explained the pertinent phases of each and answered questions of attending members.

E. J. Metzger, head of the Castings and Forgings Section, Materials Branch of the Office of Price Stabilization, then discussed tentative plans for price control of the castings industry.

The society's annual dinner meeting was held Apr. 23 at the Buffalo Athletic Club at which members, wives and guests enjoyed Dr. Marius Risley, who spoke on "The Man of Science and a Sense of Humor." Leo Smith, Lakeside Bronze Inc., Buffalo, was chairman of the local committee in charge of the arrangements.

Members of the board of directors of the Non-Ferrous Founders' Society present at the meeting held Apr. 21 in Buffalo are, starting with William A. Gluntz, left foreground, and going clockwise around the table: J. D. Zaiser, H. H. White, Vaughan Reid; George Hogen, W. L. Leopold, J. H. Sorensen, G. T. Fischer, Charles Koehler, E. T. Korten, J. W. Wolfe, W. B. Wilkins, W. M. Clark, S. O. Swangren, H. J. Hodes, R. E. Bietry, C. E. Piper, L. G. Smith, R. M. Jacobs and Kenneth Jacobs

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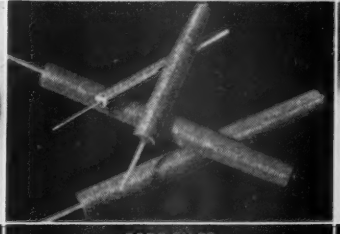

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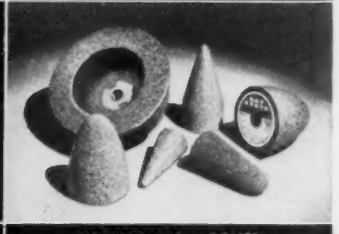

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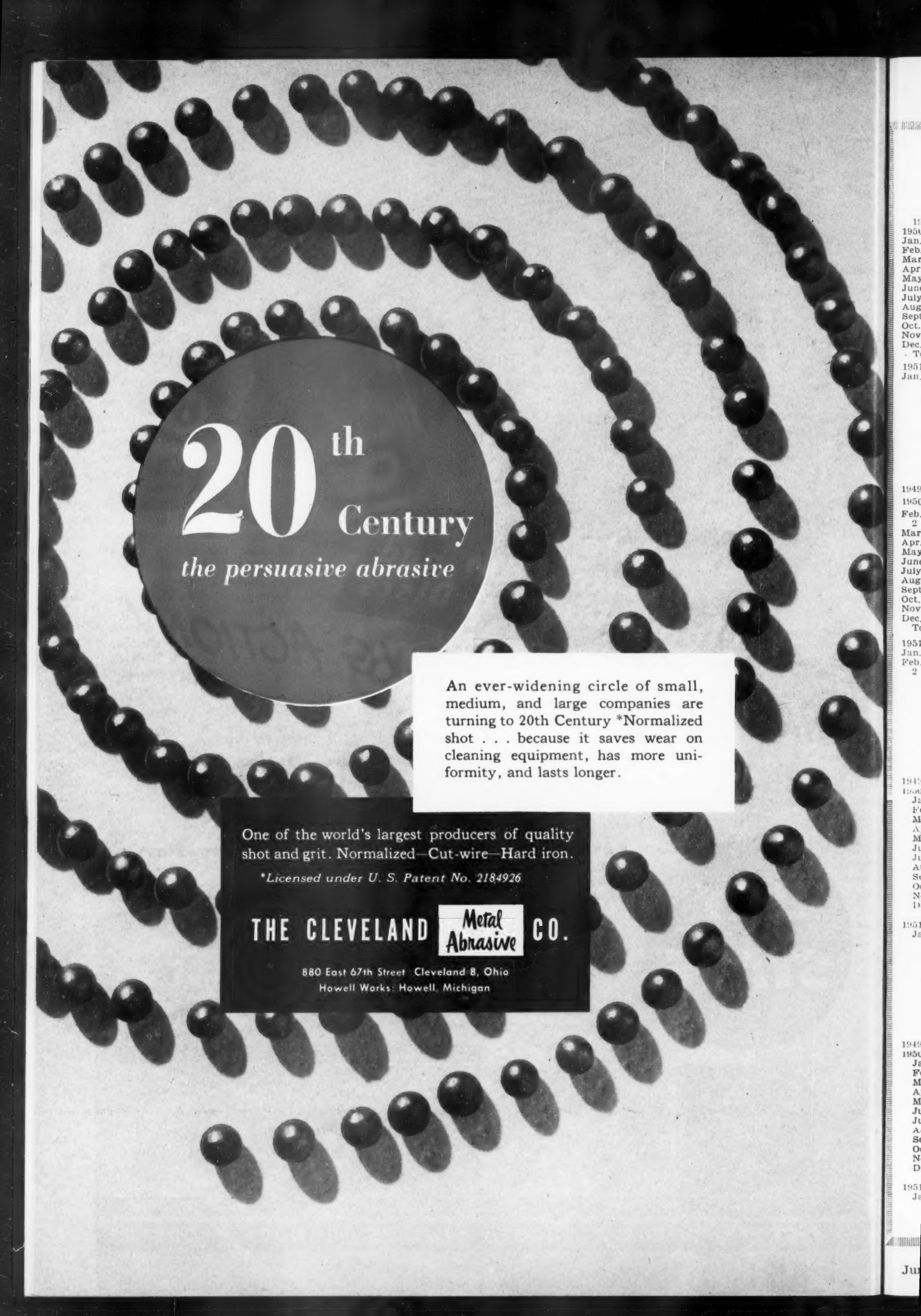
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Foundry STATISTICS

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	713,330	371,214	.....
1950			
Jan.	62,874	32,918	62,307
Feb.	60,386	31,249	67,049
Mar.	66,259	38,639	69,866
Apr.	69,822	36,279	76,250
May	76,161	42,432	77,074
June	82,345	46,613	86,783
July	67,514	37,198	105,300
Aug.	86,021	50,019	132,374
Sept.	82,479	46,927	152,583
Oct.	89,968	50,157	160,278
Nov.	85,163	48,670	180,099
Dec.	91,510	51,091	194,950
Total	920,502	512,192	.....
1951			
Jan.	92,508	54,817	234,060

Copper-base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Unfilled Orders[2]
1949	724,053	654,444	37,311	.....
1950				
Feb.	67,029	60,257	3,626	26,923
2 mo.	132,309	119,135	7,066	.....
Mar.	80,442	71,876	4,693	27,631
Apr.	72,318	64,773	3,848	28,769
May	79,108	71,605	3,751	30,880
June	83,023	74,990	3,896	32,808
July	69,033	62,414	3,789	39,906
Aug.	94,013	85,948	4,258	52,513
Sept.	95,641	87,111	4,630	58,673
Oct.	105,746	96,911	5,064	66,560
Nov.	103,694	93,607	5,776	67,931
Dec.	100,548	90,513	5,985	69,569
Total	1,016,180	918,883	52,756	.....
1951				
Jan.	102,643	92,171	6,363	77,580
Feb.	96,952	87,673	5,427	75,915
2 mo.	199,595	179,844	11,790	.....

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—Sand	Shipments—Perm. Mold	Shipments—Die	Unfilled Orders[2]
1949	304,409	106,825	102,908	87,812	.....
1950					
Feb.	28,887	10,171	9,358	8,851	44,235
2 mo.	57,646	19,817	18,758	17,861	.....
Mar.	35,845	13,035	11,094	10,870	47,350
Apr.	33,356	11,091	10,656	10,795	49,952
May	36,031	11,526	11,928	11,799	52,580
June	37,600	12,677	11,825	12,173	53,309
July	30,152	9,613	9,808	9,943	63,892
Aug.	39,852	14,117	12,682	12,207	82,564
Sept.	42,061	14,369	13,085	13,594	89,723
Oct.	47,278	15,994	14,893	15,408	102,938
Nov.	46,816	16,099	14,040	15,715	67,931
Dec.	45,999	15,675	15,052	14,322	104,380
Total	452,610	154,013	143,821	144,661	.....
1951					
Jan.	42,538	14,401	14,554	12,641	93,264
Feb.	40,784	14,105	13,082	12,852	94,575
2 mo.	83,322	28,506	27,636	25,493	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	9,364	8,781	....
1950			
Feb.	735	676	2,218
2 mo.	1,549	1,438	....
Mar.	903	849	2,322
Apr.	799	751	2,305
May	810	762	2,282
June	758	698	2,482
July	727	677	3,356
Aug.	1,147	1,078	4,855
Sept.	1,231	1,154	4,942
Oct.	1,354	1,297	5,573
Nov.	1,508	1,434	6,928
Dec.	1,528	1,444	6,958
Total	12,314	11,582	....
1951			
Jan.	1,840	1,739	8,616
Feb.	1,907	1,801	10,878
2 mo.	3,747	3,540	....

Foundry Production Workers

Estimated Number

	Feb. 1951	Jan. 1951	Feb. 1950
Gray Iron	162,200	160,800	124,400
Malleable	27,300	27,000	20,700
Steel	57,100	55,100	35,100
Nonferrous	93,500	94,300	67,700

Average Weekly Earnings

	Feb. 1951	Jan. 1951	Feb. 1950
Gray Iron	$70.15	$70.60	$58.50
Malleable Iron	71.01	71.06	59.21
Steel	73.66	72.89	59.87
Nonferrous	71.90	71.99	62.33

Average Weekly Hours

	Feb. 1951	Jan. 1951	Feb. 1950
Gray Iron	42.8	43.5	39.5
Malleable Iron	42.6	42.5	38.6
Steel	42.7	42.7	38.7
Nonferrous	41.8	42.0	39.5

Labor Turnover Rate (Jan.)
(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	6.0	4.8	2.8	0.7
Malleable Iron	7.0	5.2	3.3	0.1
Steel	7.8	4.7	3.5	0.1
Nonferrous	5.8	6.6	2.4	2.1

Source: Bureau of Labor Statistics.

Gray Iron Castings—Shipments

(Net tons[1])

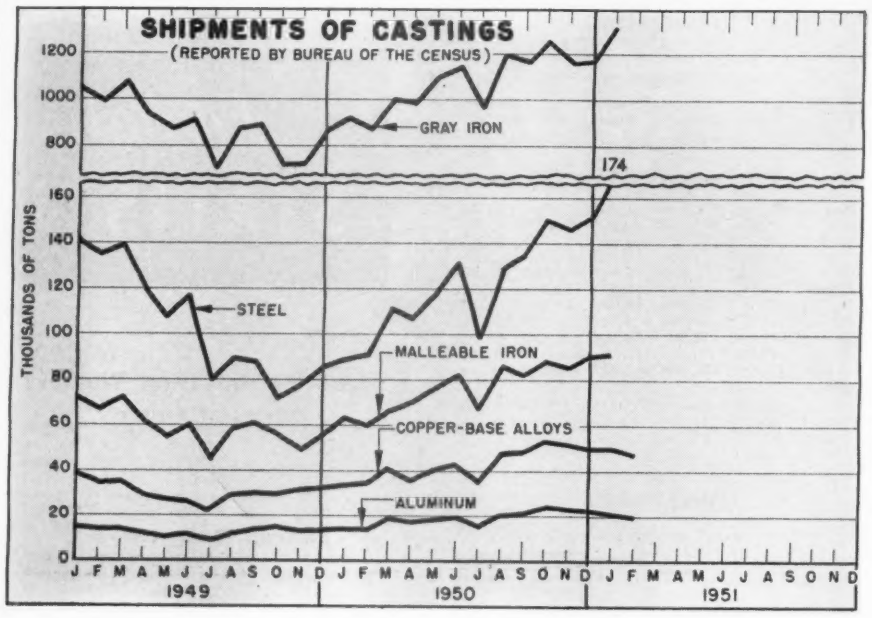
	All Castings—Total	All Castings—For Sale	Miscellaneous Castings—Total	Miscellaneous Castings—For Sale	Heavy Steel Ingot Molds—Total	Heavy Steel Ingot Molds—For Sale	Chilled Railroad Car Wheels—Total	Chilled Railroad Car Wheels—For Sale	Pressure Pipe & Fittings—Total[3]	Soil Pipe & Fittings—Total[3]	Unfilled Orders[2] Total
1949	10,549,284	5,521,441	6,624,420	2,675,411	1,776,242	759,860	555,569	493,117	1,029,743	563,310	.....
1950											
Jan.	913,321	449,577	573,743	214,752	188,152	88,244	34,254	29,409	64,095	53,077	914,185
Feb.	864,189	416,594	551,060	201,468	169,605	75,832	33,417	29,187	63,363	46,744	873,455
Mar.	995,782	500,195	635,403	244,122	170,082	71,317	44,898	39,357	89,264	56,135	921,575
Apr.	981,126	483,862	621,368	233,397	182,420	77,923	42,768	37,972	82,774	51,796	922,255
May	1,095,111	572,887	684,632	277,447	195,021	86,016	46,219	40,185	104,529	64,710	977,833
June	1,136,129	613,084	713,811	300,863	197,474	91,377	45,672	41,672	106,980	72,192	1,039,618
July	961,450	507,867	595,918	241,632	177,154	82,363	35,066	30,560	94,438	58,874	1,286,579
Aug.	1,201,569	677,134	747,046	335,868	199,770	92,340	52,508	46,681	131,127	71,118	1,670,380
Sept.	1,159,240	648,966	722,667	325,019	203,191	94,968	44,707	40,304	121,556	67,119	1,794,118
Oct.	1,254,901	700,512	792,764	364,607	220,821	100,082	46,516	41,023	119,105	75,695	1,839,866
Nov.	1,160,770	656,745	733,570	343,073	194,271	85,057	44,382	40,068	115,465	73,082	1,930,176
Dec.	1,181,974	652,929	745,766	333,033	210,700	98,071	43,667	39,984	111,066	70,775	2,012,480
Total	12,905,562	6,880,352	8,117,748	3,415,281	2,308,661	1,043,590	514,074	456,402	1,203,762	761,317	.....
1951											
Jan.	1,364,311	762,407	875,437	405,863	228,824	103,475	56,046	49,065	131,779	72,225	2,297,705

Steel Castings—Shipments

(Net tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties[3]	Carbon Steel—Total	Carbon Steel—For Sale	Carbon Steel—Railway Specialties[3]	Alloy Steel—Total	Alloy Steel—For Sale	Alloy Steel—Railway Specialties[3]	Unfilled Orders[2] Total
1949	1,250,460	865,297	232,976	944,232	659,454	223,310	299,270	205,843	9,666	.....
1950										
Jan.	88,821	57,996	9,298	64,616	41,559	8,607	24,205	16,437	691	142,484
Feb.	91,827	62,045	10,920	66,843	44,473	9,589	24,984	17,572	1,331	165,186
Mar.	111,772	77,588	15,281	82,458	56,492	14,012	29,314	21,096	1,269	185,611
Apr.	106,964	75,133	17,406	79,912	56,008	16,124	27,052	19,125	1,282	201,643
May	117,944	83,845	20,552	88,202	63,658	18,811	29,742	20,187	1,741	198,078
June	131,097	94,637	27,065	96,365	72,427	24,653	34,732	22,210	2,412	206,799
July	98,269	68,874	15,734	70,122	51,204	14,577	28,147	17,670	1,157	255,418
Aug.	128,369	94,413	24,922	92,197	70,721	22,952	36,172	23,692	1,970	329,944
Sept.	134,574	96,738	25,295	98,523	74,052	23,992	36,051	22,686	1,303	427,969
Oct.	149,558	109,660	30,048	112,704	85,157	28,493	36,854	24,503	1,555	521,846
Nov.	145,929	108,263	30,775	110,476	84,316	29,245	35,453	23,947	1,530	537,666
Dec.	155,258	113,692	34,061	118,744	88,552	32,160	36,514	25,140	1,901	554,187
Total	1,459,382	1,042,884	261,357	1,081,162	788,619	243,215	379,220	254,265	18,142	.....
1951										
Jan.	174,056	124,002	37,790	135,086	98,197	37,278	38,970	25,805	4,308	675,384

[1] Source: Bureau of the Census. [2] All cast iron pipe is shipped for sale. [3] For sale only.



Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1950	1951
Jan.	159.3	668.0
Feb.	113.1	638.6
Mar.	225.2	...
Apr.	160.6	...
May	294.9	...
June	622.7	...
July	401.8	...
Aug.	693.6	...
Sept.	483.8	...
Oct.	526.8	...
Nov.	885.5	...
Dec.	526.2	...

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Coke Production and Consumption

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1949	63,637,429	63,462,233	2,778,868
1950			
Feb.	3,994,106	4,628,331	201,927
2 mo.	9,476,140	10,522,028	455,004
Mar.	5,280,660	5,371,012	241,844
Apr.	6,156,294	6,005,632	277,673
May	6,397,032	6,385,493	294,334
June	6,238,067	6,255,094	276,565
July	6,368,489	6,265,821	267,142
Aug.	6,417,404	6,420,483	278,306
Sept.	6,263,214	6,243,584	274,657
Oct.	6,649,935	6,543,428	332,444
Nov.	6,243,970	6,131,733	317,120
Dec.	6,606,464	6,590,823	322,458
Total	72,097,669	72,735,131	3,337,517
1951			
Jan.	6,791,828	6,766,767	330,698
Feb.	6,001,616	6,037,085	291,255
2 mo.	12,793,444	12,803,852	621,953

Ingot Brass and Bronze

(Shipments in net tons)

	1950	1951
Jan.	18,874	28,416
Feb.	18,487	27,168
Mar.	22,494	31,997
Apr.	22,118	.....
May	23,643	.....
June	25,093	.....
July	21,609	.....
Aug.	29,689	.....
Sept.	28,811	.....
Total for year	303,563	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1949	377,779	248,679	.....
1950			
Sept.	49,079	31,125	89,787
Oct.	51,031	33,287	97,102
Nov.	48,852	32,844	102,524
Dec.	47,818	31,161	102,636
Total	536,398	341,833	.....
1951			
Jan.	41,166	27,646	90,596
Feb.	38,964	25,307	93,605
2 mo.	80,130	52,953	.....

Iron and Steel Scrap Consumption

(Thousands of gross tons*)

	All Scrap Total	All Scrap Purchased	By Type of Furnace: Cupola Total	Cupola Purchased	Air Total	Air Purchased	Electric Total	Electric Purchased
1949								
Dec.	4,750	2,229	666	332	67	23	379	233
Total	49,281	22,922	7,968	4,175	801	276	4,239	2,608
1950								
Jan.	4,906	2,267	699	337	71	25	433	259
Feb.	4,539	2,149	670	315	71	27	417	253
Mar.	5,101	2,430	778	372	87	31	497	296
Apr.	5,119	2,451	766	365	79	29	493	300
May	5,333	2,552	837	416	85	32	539	324
June	5,122	2,483	864	427	92	33	533	317
July	4,708	2,244	669	318	79	28	490	295
Aug.	5,202	2,454	862	426	108	39	568	327
Sept.	5,170	2,468	819	404	109	40	579	348
Oct.	5,643	2,707	866	437	108	40	643	384
Nov.	5,293	2,598	841	431	107	39	593	364
Dec.	5,361	2,600	803	418	122	44	600	361
12 Mo.	61,497	29,403	9,474	4,666	1,118	407	6,385	3,828

Pig Iron Production and Consumption

	Production** (Standard grades—1000 net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace, 1000 gross tons) Total	Cupola	Air	Electric
1949	53,408.7	2,821.9	2,294.5	41,312.5	6,979.8	47,928	4,510	235	96
1950									
Mar.	4,546.8	232.4	201.2	3,554.9	558.3	4,267	448	23	8
3 Mo.	13,875.9	622.8	615.5	10,827.4	1,810.2	12,876	1,265	63	98
Apr.	5,502.8	259.2	229.1	4,298.3	716.2	4,954	449	23	11
May	5,773.6	257.7	223.5	4,572.3	720.1	5,203	474	24	13
June	5,549.3	209.5	257.7	4,393.8	688.3	5,033	494	25	13
July	5,804.2	269.3	282.2	4,561.2	691.5	5,018	403	23	14
Aug.	5,706.2	257.0	284.0	4,407.3	757.9	5,136	516	30	18
Sept.	5,614.6	244.0	257.2	4,380.9	732.5	5,092	500	26	17
Oct.	5,836.8	284.1	260.6	4,541.2	741.0	5,219	466	31	13
Nov.	5,316.5	277.1	279.1	4,093.7	666.6	4,817	462	30	14
Dec.	5,609.2	264.9	260.2	4,374.4	709.8	5,068	456	34	15
12 Mo.	64,589.1	2,870.4	3,034.2	50,450.5	8,234.0	58,416	5,475	319	326
1951									
Jan.	5,801.7	300.0	233.3	4,529.8	738.6	....	....	...	...
Feb.	5,084.8	238.7	226.0	4,007.2	612.9				
Mar.	5,919.3	267.9	276.5	4,647.5	727.5	....	....	...	...
3 Mo.	16,805.8	806.6	735.8	13,184.5	2,079.0	....	....	...	...

* Source: U. S. Dept. of Interior, Bureau of Mines. ** Source: American Iron & Steel Institute. [1] Source: Bureau of the Census. [2] For sale only.

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Sales and Service from coast to coast

Adventures of BILL

By PAT DWYER
Illustrations by RICHEY

NOW that the shouting and tumult have died down in Buffalo," I said to Bill the other night, "now that the captains and the hosts have jumped on their horses and ridden away in all directions, I suppose we can settle down to another year of peace and quietness. Reminds me of a cute little nursery rhyme—slightly censored—composed by the late R-r-robbie Bur-r-rns and directed at an ancient tomcat sleeping on the hearth. 'Hoo Ah envy ye, ye scut. Na bills to pay, na lines to write. Sleep a' day, and pr-r-r-owl a' night!' "

"Purry good," Bill admitted, "purry good. I must tell that to a highly respectable friend of mine, well over eighty, retired from active life years ago, wears a long tail coat and takes up the offertory collection on the Sabbath and all that kind of stuff. The president of the company for whom he worked at one time sent him a cordial invitation to attend the Buffalo convention. 'Come as our guest,' he wrote. 'We shall consider it a privilege to take care of all your expenses, except those contracted between 1 and 7 a.m. every night!'

"He was about as accurate and optimistic as you were in your carelessly expressed belief that we can settle down to another year of peace and quietness. Another year, says you! Orders for castings will come in a torrent by mail, telephone, telegraph and by personal messenger. You will be swamped with offers of all kind of raw and finished materials. The 12 lost tribes of molders, coremakers, melters, apprentices, handy men, snaggers, crane men shippers, chemists, metallurgists, general office men, salesmen, superintendents, foremen, invisible for the past few years, will come popping out of the bushes and the woodwork. Every Monday morning a customer will send you a check, accompanied by a bouquet and a cordial note of appreciation for your high-class castings. Out at the Country Club your old banker pal will hint delicately that if you could use a few grand, he has a couple of barrels from which you could help yourself. Wouldn't that be just ducky?

"As a plain matter of fact and without any involved prophecy, the only orders you will get will be for castings on the forbidden list. Suppliers of raw materials will be divided into three classes: Those who will not even acknowledge receipt of your order; those who regret they are all out of whatever you want; those who mount the high patriotic platform and chide you sternly for asking whatever you asked for. You will find that the 12 lost tribes of skilled workmen are still concealed in the bushes or in the woodwork. All the king's horses and all the king's men could not flush or pop them from their hidie-holes. You should live long enough to receive a check accompanied by a bouquet of violets or lily of the valley and a cordial note of appreciation. When you have work enough for 50 men and can't flush a single specimen, I might caution you as earnestly as possible to modify your language in the presence of women and children and men with hearts that would not get them inside the door of a recruiting office.

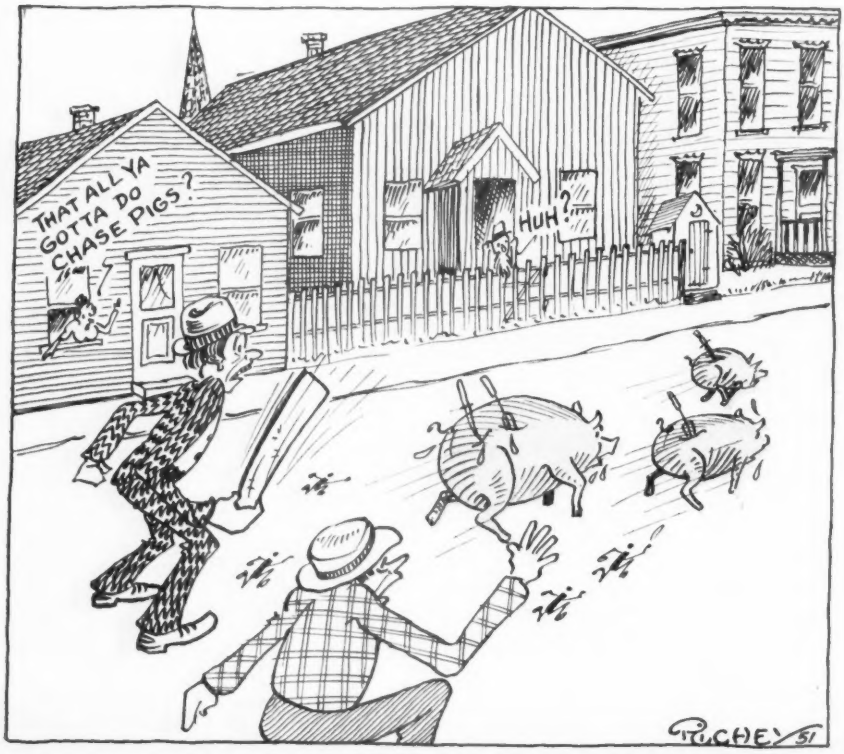
"I don't think I would be very wide of the mark if I ventured a guess that the open-handed gent in the country club was a lineal descendant of, or a refugee from, the fabulous Irish village where the streets are paved with penny loaves, the houses thatched with pancakes and where live pigs run around with knives and forks stuck in their backs, and all the while crying loudly 'Who'll ate me. Who'll ate me!'

" 'In a word' as my old uncle Malachi used to say, 'an' not to put too fine a p'int on it,' by the time in the coming year that you have consumed your second barrel of aspirin, filled in thousands of quadruple questionnaires, handed your anemic salary or income to the Great White Father in Washington, knocked another year out of the old suit, spent the vacation in the back yard, and forced the children to go barefoot in the summer, you will be in position to do a bit of revising on your estimate of a quiet and peaceful year 1951 A. D.

"However, you need not feel down hearted. You are by no means the only one who makes guesses and estimates and prophecies. I had a rather interesting experience one time with one of those super-dupers. He was not a foundryman, but like many other competent men—competent in their own particular line—he considered the foundry relatively unimportant, and its methods and processes rather primitive.

"He held to the popular conception that a foundry is a place where a workman buries a *mold* in clay or mud or ashes or something, pulls it out with a pair of tongs and then fills the cavity with liquid metal from a bucket. Quite simple and uninteresting, me good man, and quite with-

(*Continued on page* 206)



Local version of ancient coliseum game introduced by the invading Roman legions

In this unretouched close-up you can see how little 23 months of steady service have affected this lining. It looks to have many more productive months.

Takes 2 hours to install... gives 1 to 2 extra heats per day

reports this non-ferrous foundry

Average installation time per furnace: two hours —that's what the operator of these furnaces melting manganese bronze reports. He uses a combination of lining materials—one-piece rings, 1½" thick, made of CARBOFRAX silicon carbide material, backed up with 2½ inches of ALFRAX aluminum oxide cement #27.

With this ring/cement combination, the time now required per heat is only 40 minutes—and even more important, it's a *consistent* 40 minutes. As a result, this operator turns out one extra heat every day—two, if necessary. All this with a fuel cost (using natural gas) of just $.0015 per lb. of metal melted.

This operator also uses the CARBOFRAX/ALFRAX refractories combination for a large tilting furnace melting manganese bronze and for 4 very large pot-type aluminum melting furnaces.

The ALFRAX cement #27 that is mentioned is a castable cement which makes an excellent insulating, backing-up material. As a matter of fact, it's one of the most refractory insulating materials available. And it's easy to install—all you do is mix with water and handle like Portland cement.

The CARBOFRAX material — available as rings, ring segments, and cements—is characterized by exceptional resistance to flame erosion, spalling and cracking. CARBOFRAX linings don't soften, even at high temperatures—require a minimum of patching.

If you will advise us of your operating conditions we'll be glad to furnish pertinent information.

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Dept. A-61, Refractories Div. Perth Amboy, New Jersey

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You can save up to 95% of your costs in screening Moulding and Core Sands, Medium Fine and Coarse Dry Materials when you use a Combs Gyratory Riddle. Operating for less than 1c an hour, Combs Riddles do the work of 10, 20 or 30 men, depending on the type you select. Sturdy, simple to operate, they give you better mixed material, thoroughly sifted, fluffed and aerated. Fully enclosed motor practically eliminates maintenance cost.

TYPE "V" (illustrated) and **TYPE "V-5"** (36" screen) have 10 and 30 manpower capacity respectively. Remove, clean, replace screen in 5 seconds.

TYPE CS (24" square screen) fully automatic discharge of gaggers, refuse, etc. Lets man do continuous shoveling. Only $320 f.o.b.

PROMPT DELIVERY FROM YOUR FOUNDRY SUPPLY HOUSE
SEND FOR FREE DESCRIPTIVE FOLDER

(*Continued from page* 204)

in the compass of a rather rough, uncouth and illiterate class of workmen. God help us all. Sometimes I am undecided whether to laugh at or pity their ignorance when they talk about clay and call a shovel a spade.

"On a certain memorable occasion one of these self-appointed critics remarked to me naively that he understood perfectly how the lower part of the mold was formed, but really he was at a loss to understand how I made the mud stick to the cover. I assured him gravely it was a secret process guarded jealously for many years by members of the molder's union. It was one of the many inside tricks of the trade withheld from the apprentice until he had finished serving his time and had been initiated and established as a journeyman in good standing. I did not know if I was justified in divulging the secret to an outsider. I told him that I felt he was a man of discretion. If he promised to keep the secret under his hat I would take a chance. He promised readily, but not too eagerly.

"I told him that a certain amount of iron filings from the machine shop was mixed with the facing sand. The iron bars in the cope were heavily magnetized and held the treated sand in place. He nearly tripped me when he said he had seen some molders using wooden boxes. I hastily assured him that if he had examined them closely—a totally improbable contingency—he would have noted that a row of nails projected downward from the lower edge of each bar. The nails were magnetized. In addition I was sure he had observed that short iron rods, bent at one end and known technically as gaggers, were adjusted in place all over the exposed surface of the mold. Attraction of cohesion held the gaggers in place when the cover was lifted from the mold. Magnetic attraction held the prepared sand in contact with gaggers."

"Do you mean to tell me," I said, "that you handed that line of bunk to a presumably intelligent person and—to use one of your own expressions—got away with it?"

"Hand it to him?" Bill grinned. "Sure! Why not? I did more than hand it to him. I made him believe it. I showed him some of the facing sand. I don't know whether or not you ever saw it done, but in some foundries it is fairly common practice to mix iron filings with the facing sand used on the teeth in a gear wheel mold. Iron in the sand acts as a chill in a mild way and produces a much closer grain in the teeth of the casting than if they had been

(*Continued on page* 208)

Molding Machines

New Bulletin describes SPO line of Jolt Pin Lifters

Complete data on the Series 3000 high-production jolt pin lifters are presented in this new illustrated catalog which is available to foundry management and purchasing personnel such as superintendents, foremen, production expediters, etc. Designed for maximum speed, safety and ease of operation, these machines feature the patented SPO "inverted jolt" mechanism.

The jolt pin lifters described in this publication have jolt capacities ranging from 750 to 4000 pounds and are fully adjustable to meet diversified production demands. Pivot type adjustable lifting pins will accommodate any type or size of flask within their capacities. Both breakaway and secondary draw speeds can be adjusted to different job requirements, and jolt impact intensity of each machine is variable.

In this catalog, dimensions, capacities, pattern draw, SPO vibrator size and other pertinent data are tabulated for quick reference. Photographs and line drawings depict the construction and features of the various machines.

Bulletin No. 30 will be sent upon receipt of coupon or letterhead request.

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GRADE "A" — will conform to the following composition:

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Manganese	25.0 to 30.0%
Total Impurities (Principally Iron)	3.0 to 5.0%
Copper	Balance

"FALLS" MANGANESE COPPER is also used for deoxidizing brass, white nickel casting alloys and nickel silver containing lead. As well as being an active deoxidizing agent Manganese has great affinity for sulphur and this combined with its ability to absorb gases makes "FALLS" MANGANESE COPPER a very important alloy for use in the foundry.

WRITE FOR COMPLETE DETAILS

NIAGARA FALLS
Smelting & Refining Division
Continental Copper & Steel Industries, Inc.
BUFFALO 23, NEW YORK

(Continued from page 206)

formed in ordinary sand. I took this bird down the gangway to where a man was making a gear wheel mold and showed him the sand. I picked up a handful and rubbed it on a shovel handle and of course the polished surface disclosed the iron particles scattered all over it quite distinctly. Convinced? I should not be surprised to learn he had prepared a paper on the subject to be presented before one of his societies. I have seen papers, voluminous papers, based on slighter foundations.

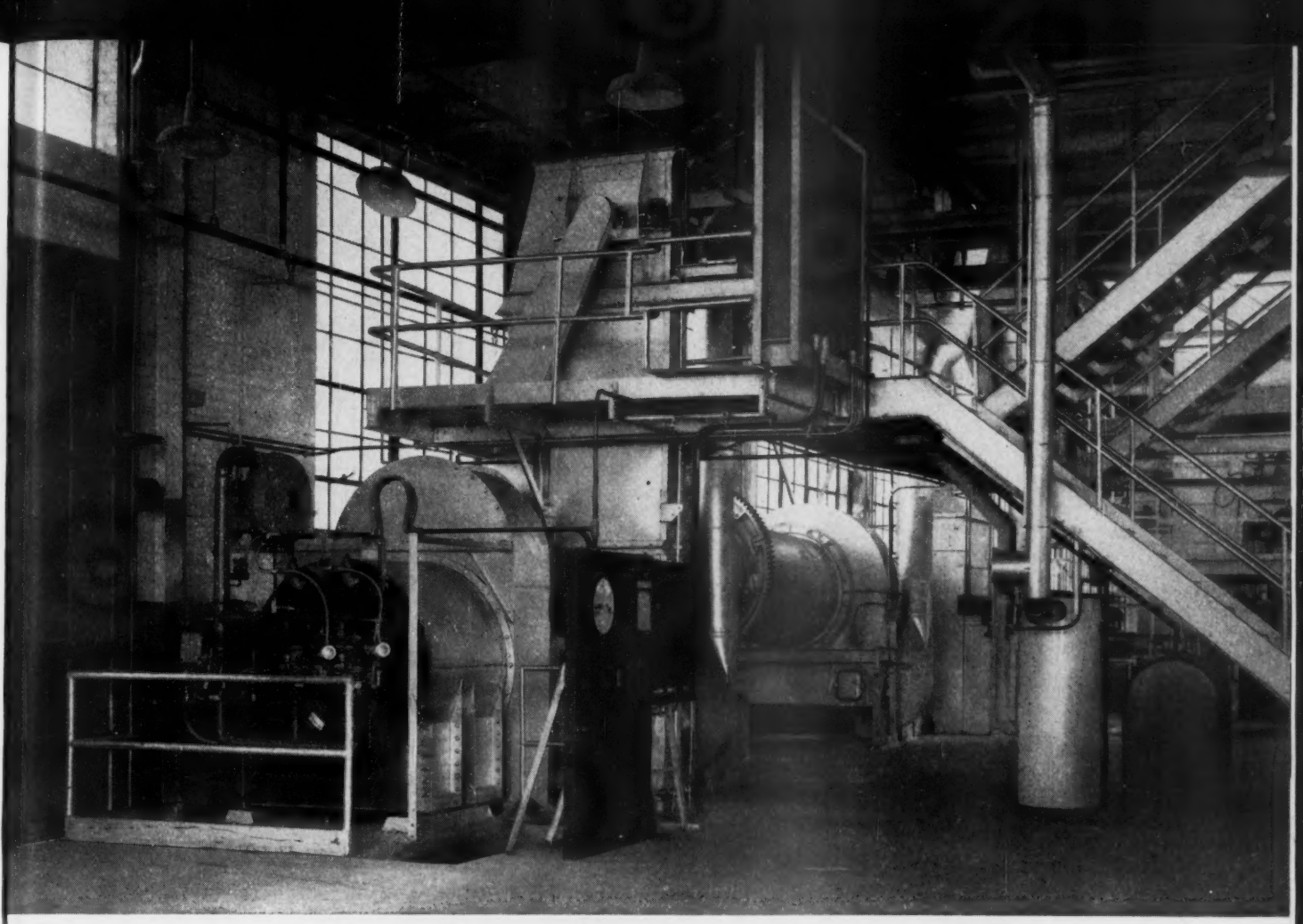
"While I have no qualms of conscience," Bill continued, "at kidding one of the lambs outside the fold, I try to keep to the straight and narrow path when discussing foundry subjects with a foundryman. Here is a typical example in a letter I received:

Formerly we tumbled gates, risers and scrap castings before charging them in the cupola. A new foundry superintendent claims this is not necessary. Information in the AFS *Cupola Handbook* is not definite on this point. The book states that sand, dirt and iron oxide form a slag blanket which retards proper combustion, forms a bridge over and under the tuyeres, slows down the melting rate, etc. In the present writer's opinion excess sand is detrimental. Some of the sand eventually will reach the tap hole. We have had considerable trouble with slag in the iron. We are reasonably certain that slag is responsible for the majority of our casting defects. We shall appreciate an unbiased opinion on this subject.

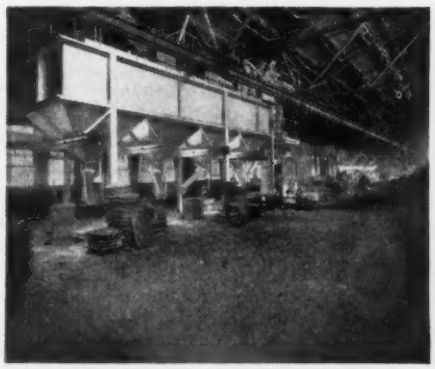
"I wrote him that, as with many legal, financial, political and human disease problems, it is impossible to give a simple yes or no answer to the question 'Is it necessary or advisable to clean the sand and rust from sprues, gates and scrap castings before incorporating the material in a cupola charge?' Without any intention to weasel out of a tight corner it may be said that the answer depends on many factors—duration of the heat, relative proportion of iron, coke, air and fluxing material.

"Another indeterminate factor also is present. Although the cupola (Q-Blow by common and unanimous consent to all foundrymen, even by those who know how the word is spelled) is the most convenient and economical melting medium in the gray iron foundry industry, in bessemer steel plants and in malleable duplexing foundries, it is still a more or less hazy or unknown device to many foundrymen. Despite the volume of literature, lectures, pamphlets, instructions and books, many foundrymen abuse the old faithful furnace. In this respect the cupola is in the same class with the ostrich who swallows everything edible and inedible.

(Concluded on page 210)



Apron Conveyors Are Unsurpassed for Handling Hot Sand and Castings from the Shakeout—Also Cut Time and Cost of Conveying Castings Through Cleaning Departments. Types, Sizes and Pitches for any Layout.



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Gray Iron Foundry reports:
47.7% less abrasive used per load of castings cleaned

Malleable Iron Foundry reports:
32.7% lower abrasive and maintenance costs per ton of castings cleaned

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24.9% reduction in abrasive costs alone

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Established 1890

(*Concluded from page* 208)

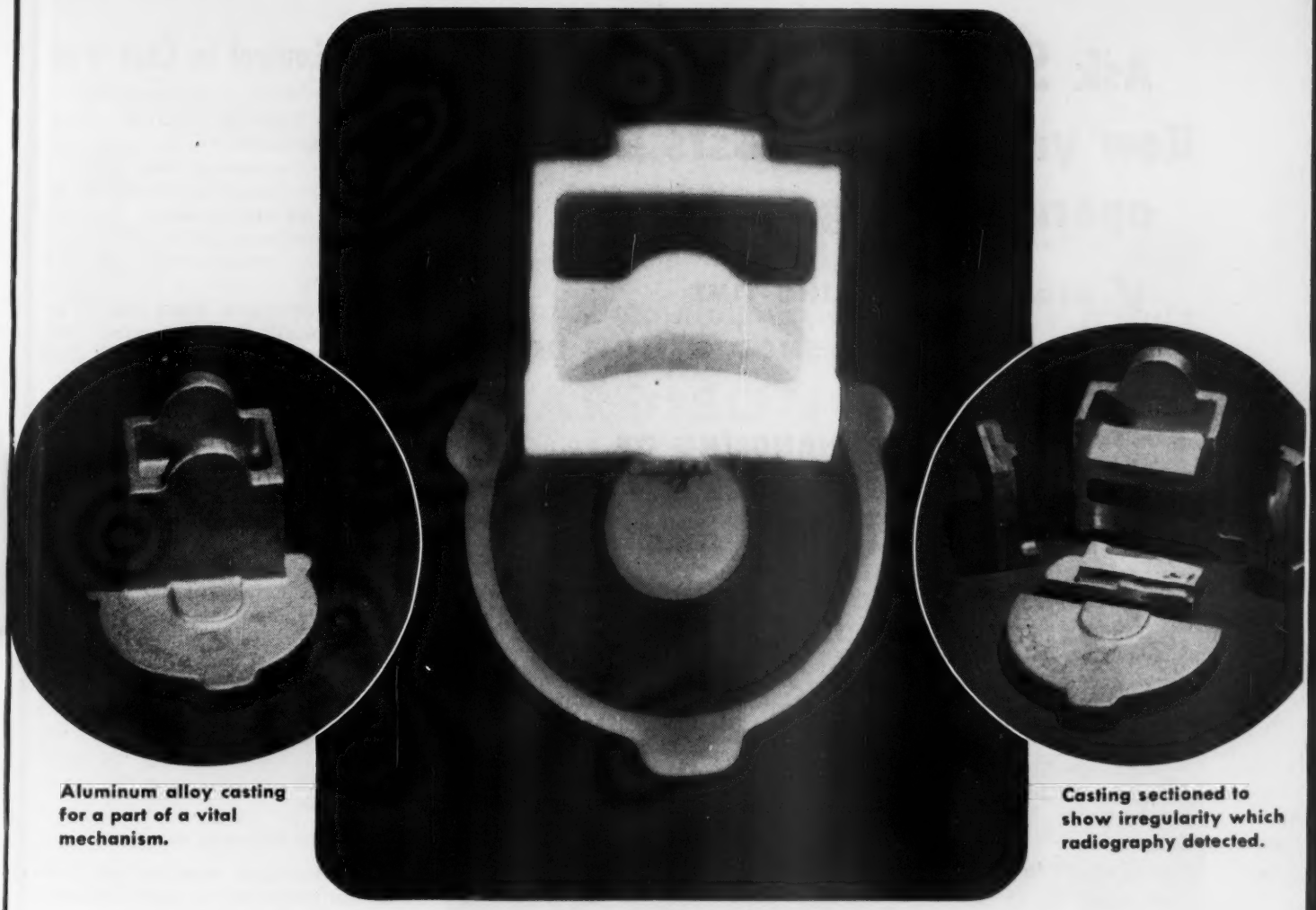
or those incredible old characters who spill a poisonous brew into their stomachs from seven years of age to 90, and die triumphantly with a glass clutched in the palsied right or left hand. The cupola will function more or less satisfactorily in spite of considerable abuse.

"Many present-day foundrymen with the fervor which characterizes all true disciples are ready and willing at the drop of a hat, or other suitable starting signal, to uphold a negative or positive argument on the advisability of cleaning sprues, gates and scrap castings, before they are thrown into the cupola. Men with unusually long memories can, and do, refer to the practice in the shops where they served their time. This style of argument usually is considered a clincher despite the well known evidence of Mark Twain on another subject 'The older I get, the better I can remember things that never happened!'

"Some of the old timers can remember distinctly 'in the old shop where I served my time the old man always threw a shovel of clean parting sand on every charge. Although I have been around and about considerable since that time I ain't never seen better nor hotter nor cleaner iron!' The fact that the usual heat in those days did not run over 1 or 2 hours, causes modern foundrymen to harbor secret doubts on the efficacy of a shovel of clean parting sand.

"Several years ago, (February and May 1940) FOUNDRY presented a description of a tumbling barrel installation for cleaning gates, etc., in the Buick foundry, Flint, Mich., where the daily heat was 800 tons, the scrap loss 1 per cent, and the yield in good castings 78 per cent. The installation was prompted by economic reasons and not by any trouble in operating technique. Reported results showed a silicon loss of 10 points, coke reduction 20 lb per 4000 lb charge, limestone from 80 to 60 lb per charge. Cost reduction was appreciable on an 800-ton daily heat.

"In the present instance we are inclined to the opinion that your immediate problem is the prevention of slag from entering the castings, and the prevention of slag from forming a bridge in the cupola. Solution to the problem is found in melting the iron at a temperature between 2800 and 2900 F. At this temperature the thin liquid slag will flow readily through the slag hole at the back of the cupola, or through an opening in the side of the spout where the spout is provided with a dam. You may have to adjust the cupola charges and volume of air to some extent."



Aluminum alloy casting for a part of a vital mechanism.

Radiograph which revealed imperfection in the casting.

Casting sectioned to show irregularity which radiography detected.

Radiography helps prevent delays in production

ALONG with scores of other castings, this one becomes part of an intricate mechanism. Extremely high quality is a must. Machining is long, complicated, and precise. Should the casting be imperfect, not only the piece and the machining time are lost—the flow of finished parts is disrupted and a whole assembly line delayed.

This is why it pays the foundry well to check the casting radiographically. It is the one way any foundry can be certain it releases only sound castings. And, equally important, it is a way that not only detects irregularities but, at the same time, indicates ways to revise gating, venting, pouring temperature, and other variables which influence consistently good work.

Ask your X-ray dealer to explain the many ways radiography can increase your yield and cut your costs.

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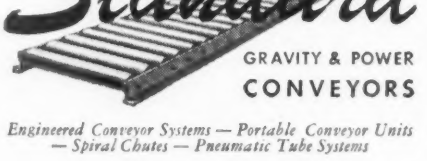

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Chill Control in Cast Iron

(*Continued from page* 129)

fracture. When the rate of solidification approaches the so-called critical rate the casting will exhibit a mottled or transition structure. Inoculants are used primarily to reduce chilling tendency and, in effect, alter the normal critical cooling rate of a given iron.

These structural zones can be observed visually in the car wheel fractures shown in Figs. 1 and 2. Iron analyzing 3.50 per cent total carbon, 0.50 per cent silicon and inoculated with 3 g of tellurium + 2 oz of graphite produces the typical car wheel fracture shown in Fig. 1. For the same metal composition treated with 4 oz of 90 per cent ferrosilicon the typical fracture is included as Fig. 2 for comparison purposes. It can be seen that the car wheel made with the tellurium-graphite practice shows marked improvement over the wheel inoculated with 90 per cent ferrosilicon. The clear chill is even across the section and the mottled zone follows a similar pattern whereas in the latter both chilled and mottled zones are extended and rather uneven across the section.

Show Different Structures

Metallographic samples cut from various positions in these fractures illustrate the nature of the microstructure at different levels for the two inoculation practices. Representative structures found at the chill surface are presented in Figs. 4 and 8. It is obvious that the tellurium-graphite treated iron has a finer primary carbide structure than the ferrosilicon-treated iron. The difference in the primary carbide grain size and the nature of the interstitial, partially spheroidized cementite is more evident at the higher magnification depicted in Figs. 5 and 9.

The importance of structural refinement in chilled iron to improve the physical properties has been discussed by Massari.[7] He has called attention to the fact that failure of chilled iron castings due to impact blows struck in a plane parallel with the grain of the metal is much more prevalent in coarse-grained metals than fine-grained ones. Consequently it is highly essential that the as-cast structure of the metal be as fine as possible so that refinement of the primary carbide structure and improvement of the physical properties of the chilled iron need not be accomplished by heat treatment.[8]

Representative structures found at the beginning of the mottled zone are shown in Figs. 6 and 10, and

(*Continued on page* 214)

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are available for every requirement

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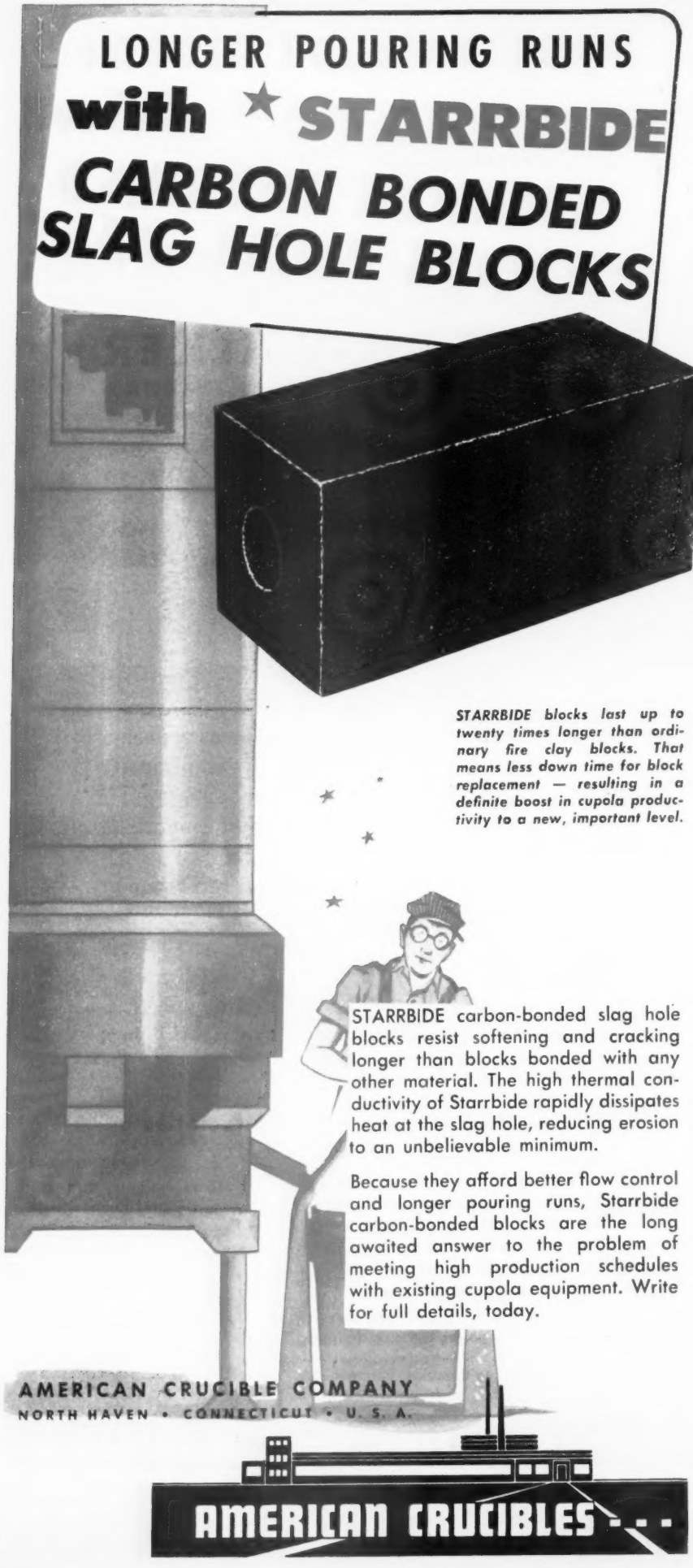
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AMERICAN CRUCIBLES - - -

(*Continued from page* 212)

those depicting the respective structures found 2 in. below the chill face in Figs. 7 and 11. It can be seen that the refinement of the primary carbide phase in the tellurium-graphite treated iron continues on through this region and is a very minor phase at a point 2 in. below the chill face whereas in the ferrosilicon treated iron a significant amount still persists in line with the extended mottled zone observed in the car wheel fracture. The significant aspect to be noted here is that the mottled zone of the former is short compared to the latter, thus providing a good backing for the chill. A shortened mottled zone is important because it is the weakest area in the structure and the most likely area where cleavage can occur. Generally, inoculants function to a varying degree in producing a shortened mottled zone. The performance of silicon carbide inoculation in unalloyed and alloy chilled iron has been demonstrated.[9] Finally, no evidence of a telluride phase was found in any of the metallographic samples that were prepared for examination.

Chill Test Results—The pouring, casting and annealing operations are important parts of the process in manufacturing chilled car wheels and require close control. In a cupola melting operation a large reservoir ladle (for example, 12 ton) feeds bottom pour ladles, each of which holds enough metal to cast two car wheels. The iron is not poured hot, being at a temperature of 2440-2450° F going into the transfer ladle and around 2350° F into the molds. A schedule of ladle holding times to get to the desired pouring temperature has been developed, for mottling of iron treated with tellurium-graphite can occur even if it is poured at 2500° F.

The influence of pouring temperature has been demonstrated by Massari and Lindsay.[2] By employing graphite as an inoculant and casting chilling test blocks, they proved that decreasing pouring temperature produced a decreasing depth of chill and a refinement of the mottled zone. Another essential feature in the production is annealing. As soon as possible after the metal has solidified in the molds the castings are shaken out and immediately placed in soaking pits where they cool slowly and thus prevent intense strain and cracking. A time lapse of only 45 minutes between casting, shakeout and insertion of the wheels in the soaking furnaces has been accomplished with modern equipment.

On the basis of a chill test, the

(*Continued on page* 216)

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FOR YOUR MELTING PROBLEMS?

The Campbell-Hausfeld Co.
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(*Continued from page* 214)

melter can judge how much graphite to add in the ladle with the tellurium to produce a satisfactory chill depth in the car wheel. Thus, for example, if the clear chill on the block is 30/16 in. then 7 oz of graphite is added with the customary 6 g tellurium addition; if only 28/16-in. then 4 oz of graphite is added with the 6 g tellurium. The practices are adjusted to produce between 7/16 and 15/16 in. clear chill in the car wheel. However, it should be emphasized that the iron from the cupola must be at the proper silicon level, otherwise chill control cannot be manipulated successfully with graphite additions. The standard practice is to hold the chill test in the mold ten minutes before quench and fracture. Accordingly, each test represents metal which has already been cast into ten wheels and any subsequent adjustment in the ladle addition would then cover a like quantity of wheels. Therefore, the importance of proper chill control becomes quite evident.

Make Series of Tests

The matter of reducing the depth of the mottled zone in proportion to the clear chill is where tellurium's partner undertakes its primary function. To show the magnitude of this effect a series of 1½ x 3 x 6 in. chill test blocks were poured at 2350° F with the addition of 6 g tellurium, 6 g tellurium +4 oz graphite, 6 g tellurium +8 oz graphite and 6 g tellurium +16 oz graphite. The chemical analysis and method of casting have been described in a previous section. The test bar fractures are shown in Fig. 3, together with Brinell hardness measurements made at ½-in. intervals below the chilled surface, employing a 3000 kg load and 10 mm ball.

It is a well known fact that the hardness of an iron is maintained to the extent of the clear chill depth. The results show the gradual reduction in hardness with increasing graphite addition which becomes quite evident at the ½-in. and 1-in. levels below the chilled surface.

Chill depth and hardness measurements on chill test blocks are only an indication of what the same properties will be in the car wheel. Therefore, it is still necessary to verify the correlation by making the same tests on the latter, in order to verify that the wheel is between the 7/16 and 15/16 in. clear chill limits. The practice is to fracture sample wheels in the manner shown in Fig. 1. If the clear chill is 7/16 in. deep, indicating a brinell hardness of 352 or more, then only visual examination is neces-

(*Concluded on page* 218)

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The Overspeed Safety Coupling supplements, and is completely independent of, the regular factory-set weight type governor used in Ingersoll-Rand Air Tools.

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EXTRA EXHAUST POSITIONS—The operator can choose any one of four exhaust positions, spaced 90 degrees apart.

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(*Concluded from page* 216)

sary. If over 7/16 in., brinell hardness readings are taken at a point 3/8-in. (6/16-in.) from the flange.

If the chill is on the high side—that is, over 15/16-in.—the wheel is passed by the brinell test. Using a template, measurements are plotted in line 24/16 in. from the throat and the hardness should be 200 or less at that point. Also the same readings should be obtained at a distance of 1 in. from the facer rim. Performance tests made to evaluate wheel quality are the drop test simulating impact conditions and the thermal test simulating brake burn.

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Book Review

FBI Register of British Manufacturers, 23rd edition, cloth, 852 pages, 7½ and 9½ in., published for the Federation of British Industries, by Kelly's Directories Ltd. and Iliffe & Sons Ltd., London. Price 42s.

Providing a substantial cross-section of the most important producers of British goods in a wide range of industry, this directory is compiled and classified for quick reference with major instructions and cross-references in English, French, and Spanish. It lists over 6000 firms, their products and services. An alphabetical directory of all FBI member firms gives full addresses, telegraphic addresses, telephone numbers, list of products, and in many cases their home and overseas branches and agencies.

Trade associations are classified alphabetically and by trade categories. Brands and trade names are listed alphabetically, and trade marks by trade categories. An addenda covers products and addresses of new members elected after main sections had gone to press. One section is devoted to advertisements of various firms.

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Industry BRIEFS

NATIONAL Malleable & Steel Castings Co. is beginning a $6,300,000 expansion program at its plants in Cleveland, Chicago, Indianapolis, Sharon, Pa., and Melrose Park, Ill. Largest expenditures are planned for the Cleveland Works, where an entire new malleable foundry unit will be added. Some of the new equipment will be in operation within a few months, and all of the improvements should be completed within a year, according to Cleve H. Pomeroy, company president.

* * *

Archer-Daniels-Midland Co. has designated two new divisions at Cleveland. These are the Foundry Products Division, headed by L. P. Robinson, vice president, and the Chemical Products Division, headed by Frank C. Haas, vice president. They will continue the functions previously performed by the company's Werner G. Smith Division.

* * *

American Silica Sand Co., Ottawa, Ill., now is handling sales and analysis of applications of zircon products on a national basis, according to Fred G. Kramer, sales manager and technical advisor. The company also has exclusive foundry sales rights for Sultron desulphurizer and flux.

* * *

Service Foundry Inc., 416 Erato St., New Orleans 13, has purchased for $25,000 the building it has rented from John W. Endlehordt since 1929. M. J. Rabe Jr., is company president; P. F. Barbalich, vice president, and B. J. Peters, secretary-treasurer.

* * *

Cleveland Metal Abrasive Co., 887 East 67th St., Cleveland, is completing a plant addition designed to increase production of normalized and cut wire shot approximately 50 per cent.

* * *

Reading Chain & Block Corp., Reading, Pa., has changed its name to Reading Crane & Hoist Corp. There is no change of capital structure, personnel, ownership, or production of the company. Management continues under Fred A. Howard, president; Philip K. Howard, vice president, and Frank M. Howard, secretary-treasurer.

* * *

General Motors Corp., Fabricast Division, Detroit 2, plans erection of a plant for manufacturing permanent mold aluminum castings at Jones Mills, Ark. Plant will have about 100,000 sq ft of floor space and initial production will be predominately on defense items.

* * *

Carnes & Mitchell Machine Works, Los Angeles, has formed a subsidiary, Hollywood Alloy Casting Co., 7052 Santa Monica Blvd., Hollywood, Calif., to manufacture completely machined aluminum castings for the aircraft industry. Jack J. Gordon is the owner.

* * *

General Refractories Co., Philadelphia, will construct a $1 million plant between Eastern and Garfield Roads on Randolph Ave., Los Angeles, Calif., for manufacture of unburned refractories. The new plant will double the firm's West coast capacity.

* * *

Cal Research Inc., Buffalo, recently was incorporated as a general foundry and machine shop business. Directors are: Arthur G. and Ruth G. Leighton, 926 Harrison Ave., Niagara Falls, N. Y., and William J. Carter Jr., 117 Henderson Ave., Kenmore, N. Y.

* * *

Laclede-Christy Co. of Pennsylvania has purchased the plant and physical assets of Paterson Fire Brick Co., Clearfield, Pa. Additional facilities will be added to increase production.

* * *

Lindberg Engineering Co., Chicago, has opened a direct factory sales office in Atlanta, covering the states of Georgia, Alabama, Mississippi and Florida. Philip J. Duffy, recently with the Chicago office, is in charge.

Eastern Clay Products Inc., Jackson, O., has opened a new plant at Jackson for producing patching refractories. The addition will double the company's capacity for producing these materials, used mainly with its Bondactor machine.

* * *

Standard Stoker Co., 370 Lexington Ave., New York 17, and its Read Machinery Division, Richland Ave., York, Pa., announce a change of corporate name to Read Standard Corp.

* * *

Cleveland Vibrator Co., 2788 Clinton Ave., Cleveland, has completed a plant addition to house automatic screw machines used for vibrator production.

* * *

Alter Co., Davenport, Iowa, is expanding its copper and nickel smelting plant through construction of an addition providing 15,000 square feet. Completion is scheduled for Sept. 1.

* * *

Proof Machine & Brass Foundry Co., 936 East 72nd St., Cleveland 3, has been sold to Essex Wire Corp., Detroit, and will continue in operation as the Proof Co.

* * *

Fairbanks, Morse & Co., Chicago, has completed a new building housing the Cleveland sales and service branch at 3000 West 117th St. Harry E. Brown is manager.

* * *

Westover Engineers has moved to larger quarters at 3110 West Fond du Lac Ave., Milwaukee 10. Larger quarters will be provided for offices and laboratory.

* * *

Casting Engineers Inc., formerly of 13000 South Halsted St., Chicago, has moved into its own building at 2323 Bosworth Ave., Chicago 14.

* * *

Camden Foundry Co., 107 East Center St., Camden, Ark., has obtained a building permit for a new business building.

* * *

United States Testing Co., Hoboken, N. J., has moved its California branch to 1723 South Maple Ave., Los Angeles 15.

* * *

Crucible Manufacturers Association has moved its headquarters from 90 West St. to 122 East 42nd St., New York 17.

* * *

Superior Foundry Inc., 3542 East 71st St., Cleveland 5, has contracted for the construction of a $300,000 plant addition to contain 55,750 sq ft.

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Capacities of Lectromelt Furnaces range all the way from 25 pounds to 150 tons—sizes and styles to meet every research and production need.

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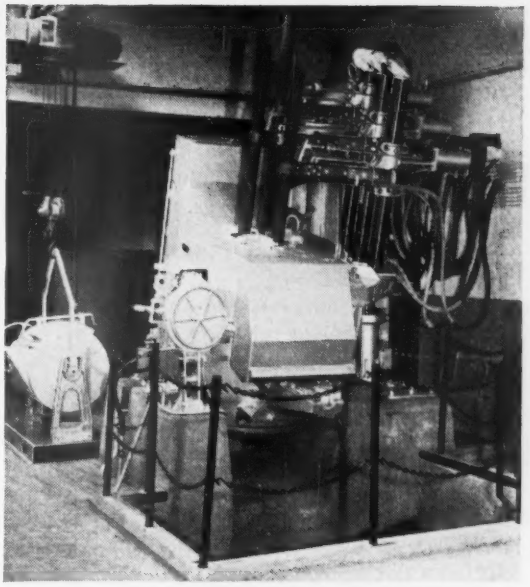
Whether you're wanting a pilot plant or production furnace, Lectromelt engineers can help determine your requirements. Pittsburgh Lectromelt Furnace Corporation, 314 32nd Street, Pittsburgh 30, Pennsylvania.



This Lectromelt Furnace, rated at 1,000 pounds per hour, is used on manufacturing development work at the new International Harvester Company Laboratories, Chicago.

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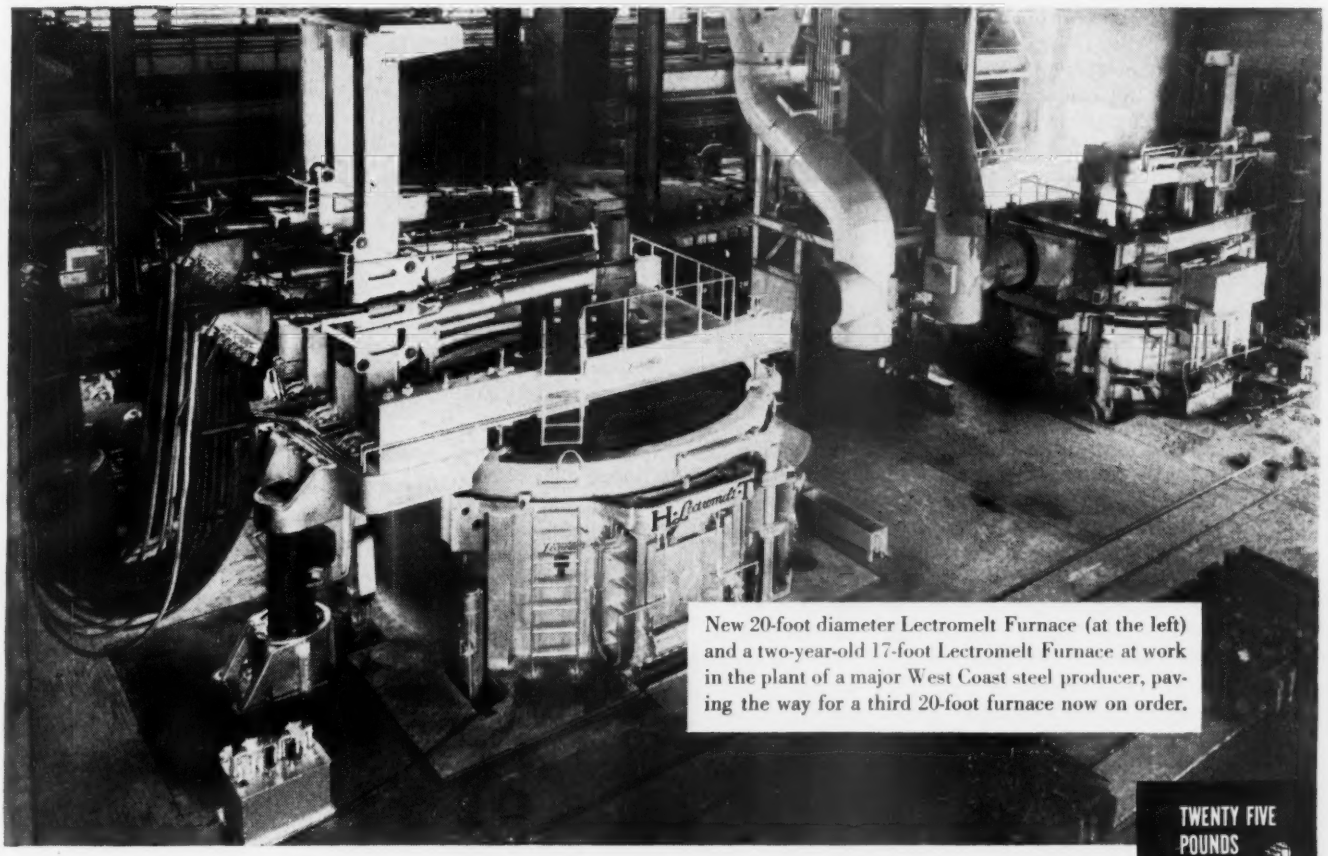
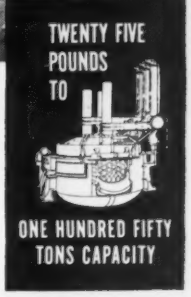


New 20-foot diameter Lectromelt Furnace (at the left) and a two-year-old 17-foot Lectromelt Furnace at work in the plant of a major West Coast steel producer, paving the way for a third 20-foot furnace now on order.

WHEN YOU MELT... MOORE RAPID Lectromelt



Why Castings Shrink

ABC of Foundry Practice

METALS expand or contract in three dimensions. The change is volumnar rather than linear. The coefficient of expansion of volume is considered sufficiently accurate when stated as three times the linear coefficient of expansion or expansion per unit of length. The average contraction of cast iron is considered to be 1 per cent or approximately ⅛ in. per foot. With different irons of extreme variations in composition and quality the contraction may range from 1/10 to ⅜ in. per ft.

Provision is made in various ways for the normal contraction of cooling metal. Patterns are made larger than the castings. Yielding cores or molds are used. All allowances take into consideration other characteristics of the metal. For example, brass and steel may be expected to contract in cooling nearly twice as much as iron. The foundryman knows that brass tends to contract a considerable amount, also that it is weak when hot. Through experience he knows that a non-yielding core in a large brass casting is certain to produce a crack. Several expedients are practiced to prevent this contingency, such as including sawdust in the core sand mixture.

Annealing Is Helpful

Contraction should be normal in amount and evenly distributed. Casting design which restrains contraction may lead to the formation of dangerous stresses within the metal. Fractures, perhaps microscopic in size at first, may be produced whenever the cohesive forces of the particles in cooling metal are not evenly and completely adjusted throughout the mass. Annealing, during which the molecules rearrange themselves, lessens the contraction stresses.

The change that takes place in metal as it passes from the liquid to the solid state is known as shrinkage. Molten metal in contact with the mold surface begins to set immediately and forms a solid shell on the outside of the casting. By the force of cohesion this shell draws liquid metal toward itself. The metal comes from the center where the metal is still fluid. The process continues until the entire metal mass has solidified. If there is not sufficient metal to completely fill the mold, the last part to solidify will suffer.

As the shell thickens there is no supply from which metal may be drawn. The result is a spongy or coarse mass and possibly a number of actual cavities. This shrinkage of metal as it sets necessitates an additional supply of molten metal from feeders or risers. Should the metal in the riser solidify the supply is cut off. To prolong the feeding time a rod can be pumped up and down and fresh, hot metal added until the casting solidifies. In other instances the riser is enclosed in an insulating material, or may be covered by a heat-producing compound. In still other instances the thickness of the riser section greatly exceeds the thickness of casting section. Therefore the metal in the casting sets before the metal in the riser.

Shrinkage May Vary

If the metal supply is insufficient to make good the shrinkage loss, splinters of metal, resembling the fractured ends of a board pulled in two, may be found in the casting interior. The pulling force is the cohesion of the metal in the outer shell contending for a supply of metal in the interior. A large amount of shrinkage with no lack of metal in the center produces a fine-grain casting. When this fine grain is desired the feeding must insure plenty of iron to make up for the shrinkage. If this is not possible, a less shrinkable mixture must be employed.

The shrinkage problem may be solved in various ways. Pattern design may be changed to get a satisfactory location for gates and risers. The gate should be located as far as possible from the point where shrinkage is anticipated. The longer journey reduces the temperature to some extent, thus allowing partial contraction before the metal reaches the shrinkage area. A difference of 300° F in temperature may be sufficient. As a general rule the first iron should go to the point or points of greatest shrinkage. It is not safe to place entire responsibility for shrinkage trouble on the designing or pattern department. In many instances shrinkage troubles may be prevented without any change in pattern design.

Where it is possible to place the pattern in position to bring the shrinkage point quite low in the mold, the static pressure and the tendency for metal to be drawn downward may be sufficient to close the grain. A riser may be placed directly over the shrinkage point and kept open with a rod and fresh metal. External or internal chills may be employed. Shrinkage cavities are caused by different parts of the casting setting at different times. The part to set last has open spaces because it supplied metal to other parts and there is no further supply. The chill will hasten the setting time in the immediate vicinity.

Shrinkage cavities appear where a heavy section adjoins a light section. A chill on the heavy section causes the heavy and the light section to set approximately at the same time. The following incident illustrates the necessity of careful consideration in the use of chills. Certain castings tested under pressure leaked at a narrow section. Thickness of this section was increased without result. A chill was placed against the original section but the leakage was not prevented. The shrinkage appeared in another place. A chill was placed on the inside and subsequent castings did not leak. Water could not penetrate the close-grain iron produced by the chill. Even if shrinkage was present in the interior it did no damage. The casting passed the pressure test.

Cannot Always Use Chills

Chills cannot be depended upon to stop all shrinkage difficulty. In certain areas the chill will make the casting too hard to machine. The chill should be transferred from the outside to the inside. Nails serve this purpose. In some instances ordinary nails will serve. In other instances special nails with heavy heads, also special wire shapes, are available. The points are pushed into the sand and the head and body project into the mold cavity where shrinkage is anticipated.

A change in the metal mixture may prevent shrinkage defects. The lower the carbon, the quicker the metal will set and therefore produce a close-grain structure. When a riser or risers cannot be placed to advantage a certain amount of metal

(*Continued on page* 224)

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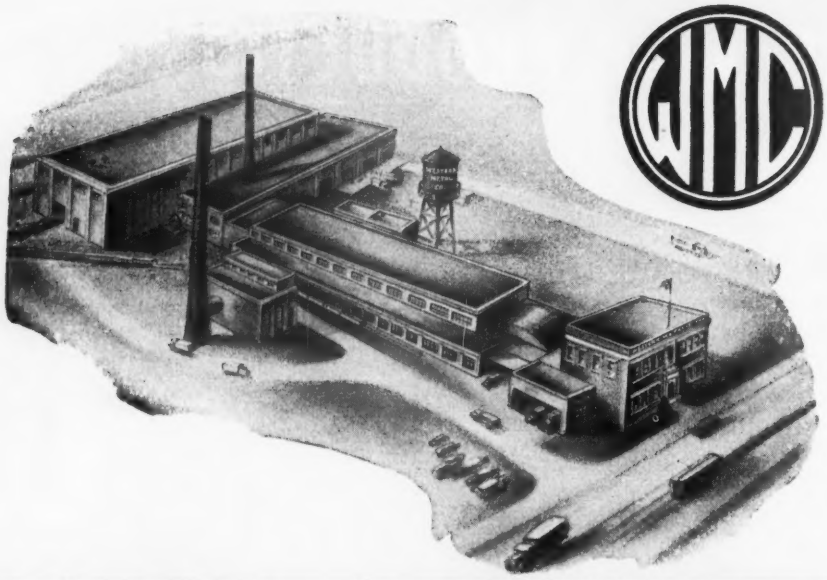
The Ohio Malleable Iron Co., Columbus, Ohio
British Jeffrey-Diamond Ltd., Wakefield, England
The Galion Iron Works & Mfg. Co., Galion, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio



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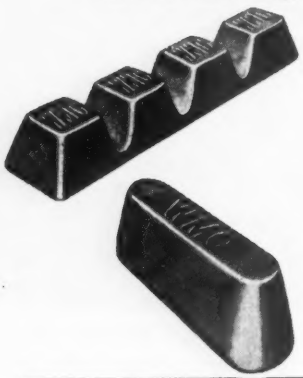

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SMELTERS AND REFINERS OF BRASS AND ALUMINUM INGOTS

(*Continued from page* 222)

is *flowed through*. Changing the mixture to prevent shrinkage requires knowledge of the effects of the different elements. Silicon and manganese affect the quality of iron through their influence on the proportion of carbon in the free and in the combined states. In molten iron all the carbon is in the combined state. In white iron the carbon remains in this state. As gray iron changes from the liquid to the solid form part of the carbon separates out as graphite. Amount depends on the metal composition and the cooling rate. When the metal cools quickly the amount of combined carbon remains high. When the iron cools slowly a large part of the carbon assumes the free or graphitic form. Silicon lowers the amount of combined carbon; manganese tends to increase it. The reverse is true with graphitic carbon. Silicon increases the amount of graphitic carbon; manganese decreases it. Graphitic carbon flakes decrease the iron cohesion. Shrinkage depends on the action of a strong cohesive force. Theory and facts agree that graphitic carbon decreases shrinkage and produces an open, coarse-grain structure. Combined carbon produces a fine, close grain.

Influences Can Be Predicted

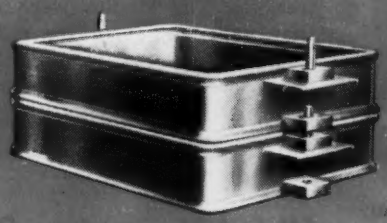
Knowing the effect of silicon and manganese on the proportion of graphitic and combined carbon and the influence of these two forms upon shrinkage and grain, it is easy to predict certain influences of these elements and to understand observed facts. When a considerable amount of total carbon is present, silicon decreases shrinkage and produces a coarse grain. This is the indirect result of silicon's production of graphitic carbon. When the total amount of carbon is not increased, manganese keeps the carbon combined and consequently increases shrinkage and produces finer-grain castings. This hardly could be otherwise since both elements act through carbon.

Effect of sulphur should not be overlooked. In earlier years and even to some extent at present sulphur has been regarded as a foundry plague. Modern foundry practice indicates that sulphur has a favorable effect under certain conditions. Sulphur increases the tendency toward shrinkage, but it also helps to close the grain, a very necessary factor in some instances.

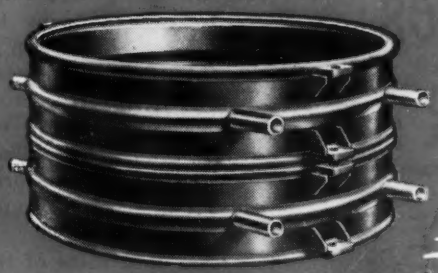
Shrinkage and contraction constitute a continuous process which begins when metal is poured and finished only when the casting has

(*Concluded on page* 226)

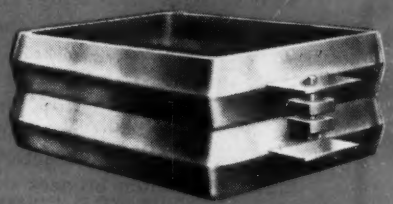
LOW FIRST COST
LOW OPERATING COST



6A—One man Flask for stacking.

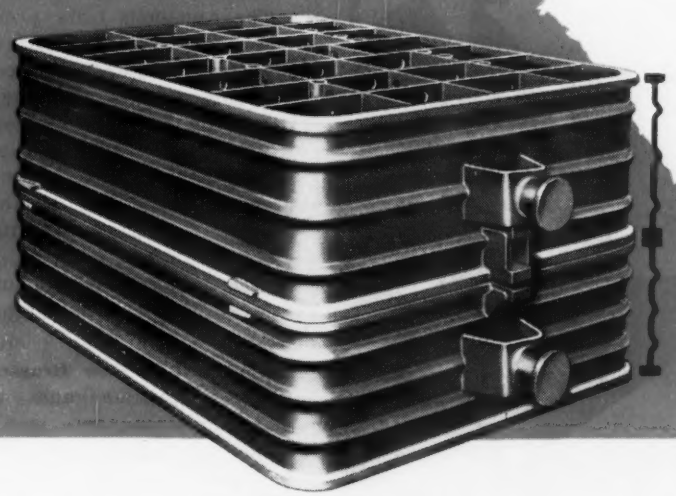


10B—Round two man Flask.



4A—Extra light weight, easy shake out.

Divide the greater number of production hours given by a Shanafelt Flask into its low original cost, and you'll get a very happy answer. Shanafelt Steel Flask equipment has been proving its economy in American foundries for over 26 years. Check it for yourself. When you need new Flasks, just remember — SHANAFELT, CANTON, OHIO — and send us your inquiry. You'll like the price and you'll like the Flasks.



The combination of corrugated sidewalls and welded flanges makes a Flask with exceptional strength and rigidity. The size of the flanges and the thickness of the sidewalls are varied to suit the requirements. The Flask illustrated is 36" x 50" — 14" Cope — 12" Drag. Weight 1010# per set.

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Serving the Foundry Industry for 57 Years

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(*Concluded from page* 224)
reached its final volume at ordinary temperature. Internal structural rearrangements are involved throughout the process. The foundryman's problem is to select constituents of the furnace charge, select patterns of the right design and pour the metal so that finally the casting will be free from dangerous internal strains, shrink holes and other defects.

References

Moldenke, Richard, *Principles of Iron Founding.*

Sears, Frederick E., *Physics for Secondary Schools.*

Dwyer, Pat, *Gates and Risers for Castings.*

Booklets Contain Data On Steel Castings

Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, has issued two booklets by Charles W. Briggs, technical and research director. "Fundamentals of Steel Casting Design" presents some of the problems and considerations involved in arriving at a properly designed casting. It points out casting problems in the foundry which might be useful to the engineer in helping him arrive at a design with satisfactory production characteristics.

"Developments Concerning the Properties of Cast Steel" contains correlated information from test data obtained in research studies on the properties of cast steels and on heat treating. The studies were made so that engineers, designers, purchasers, metallurgists and manufacturers of steel castings would be more familiar with the engineering properties of steel castings.

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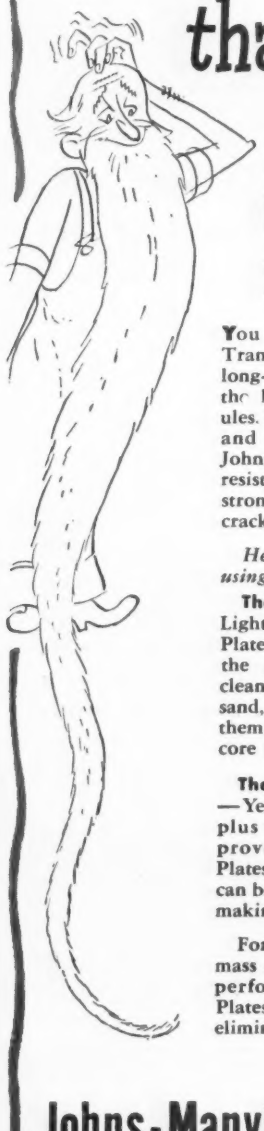

. . . then use TRANSITE CORE PLATES that stay on the job year in, year out

You can rely on durable Transite* Core Plates to give long-term service, even under the heaviest foundry schedules. Made of fibrous asbestos and cement, by a special Johns-Manville process, they resist shock and corrosion, are strong and durable, will not crack or break easily.

Here are more reasons for using Transite Core Plates:

They speed production—Light-weight Transite Core Plates are easier to handle on the job. They're easier to clean, too . . . core wash, sand, etc., do not adhere to them as readily as to other core plate materials.

They maintain accuracy—Years of foundry service, plus exhaustive tests, have proven that Transite Core Plates do not warp readily . . . can be used for precision core making indefinitely.

For core plates of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details, write Johns-Manville, Box 290, New York 16, N. Y.

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Johns-Manville TRANSITE CORE PLATES

Made of Asbestos

Nickel-Manganese Bronze

(*Continued from page* 125)

to the lower strength types of manganese bronze commonly used for propellers.

Table IX summarizes some earlier cavitation tests made by Kerr[5]. A recent high-velocity erosion test comparing a regular manganese bronze with an experimental cross - bred nickel-aluminum fortified edition of manganese bronze, showed some prospects for improved performance in special experimental product (Table X).

The tests upon some of the experimental manganese bronze compositions showed that when they were alloyed with increasing amounts of aluminum and less zinc, they seemed to improve their resistance to cavitation and corrosion. With less zinc and more aluminum in their makeup, they presumably acquired some aluminum bronze characteristics. The higher aluminum bronzes showed considerable promise as corrosion and cavitation resistors possessing high fatigue strength in the Stewart and Williams[7] Annapolis work.

The Annapolis tests, previously referred to, seemed to indicate an advantage for the 10 per cent aluminum bronze type of alloy including the 5 per cent nickel alloyed grade. A trend to convert these advantages into production has been observed abroad, particularly in the case of propellers smaller than 10-ft. diameter or 10 tons in weight. The position of the nickel-aluminum bronzes will be described in a separate publication.

Nickel in Yellow Brasses—On the fringe of the manganese bronzes or yellow brasses, there is a family of nickel alloyed products containing 1 to 15 per cent nickel. They are nickel alloyed to contribute to corrosion resistance. They may contain the strengthening ingredients of manganese bronze and sufficient nickel to possess a straw-white color. A typical sand cast composition will contain: Cu 45, Ni 12-15, Zn 38-42, Al

(*Concluded on page* 228)

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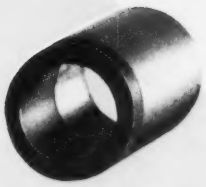
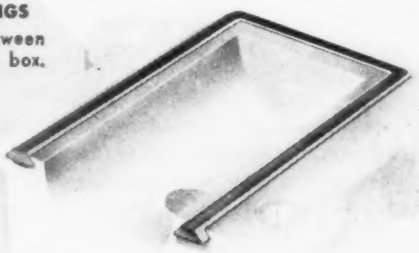
"PROTEXABOX PINS"
Cannot mar the box face because they will not loosen. Protective rubber tip guaranteed to stay on.



"SAND ARRESTER TUBE"
Save cores and step up production. Guaranteed for 100,000 blows.

Every Martin product is designed especially for "core box protection"—each is built to prevent a specific type of wear on your core boxes. They are engineered by foundry men to assure easy installation, successful operation. Martin products add years to the life of your equipment by enabling you to salvage old plates and core boxes, by preventing abrasion, and giving your plywood blow plates the lasting qualities of steel. Each product carries a guarantee of absolute satisfaction. Martin products are distributed all over the world by foundry supply houses.

"HOLINER" BUSHINGS
Stop abrasion between blow plate and core box. Protect blow holes.



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Protects parting line—easily installed in old or new boxes. Cutters for groove available at moderate cost.

"PULLINSERT" BLOW BUTTONS
Positively stop sand blasting under blow holes. Available in nine popular sizes.

"VIBROLATOR"

The powerful all-directional vibration of the Peterson Vibrolator makes this an ideal unit for keeping materials flowing in chutes or hoppers. The Vibrolator will not crack attaching lugs on match plates or core boxes. Instantly self starting and virtually noiseless in operation, this new type vibrator eliminates maintenance worries and gives a long, dependable service life. No lubrication is necessary. The Vibrolator is light in weight to lessen fatigue and permit maximum delivery of vibration. There are five sizes available to meet all your foundry requirements. Peterson Vibrolators are sold only by Martin, exclusive manufacturers of ball-type vibrators.

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(*Concluded from page 226*)

0.50, Mn 0.50, Others 1.0. Physical properties include 70,000 psi tensile strength, 15 per cent elongation and 150 brinell hardness.

The yellow brasses are noted for their ability to be "hot worked," and, therefore, provide material suitable for die-cast, hot stamped, forged and extruded alloys. Some of these brasses contain a small amount of nickel and are called nickel brass, while others contain 10 to 15 per cent nickel and qualify for the nickel-silver classification although not fully bleached to the rich white color of the 20 per cent nickel type of nickel silver alloy. They may contain enough nickel to possess the pale-straw color of nickel silvers comparable to the wrought "key-stock".

A wrought nickel brass possessing high strength and an improved corrosion resistance over yellow brass is Hi-ten-si-loy made by the Titan Metal Mfg. Co. and procurable in die castings. It has the following composition and properties in the No. 11 grade: Cu 57, Pb 1, Ni 1.75, Zn balance; yield point 45,000 psi, tensile strength 80,000 psi and 85 Rockwell B hardness. A companion material, Resistaloy, available in rod form only, offers improved corrosion resistance over the yellow brasses. Resistaloy No. 12 analysis: Cu 59, Ni 1, Al 2, Zn balance; yield point 58,000 psi, tensile strength 95,000 and 90 Rockwell B.

These nickel brass alloys find applications for marine hardware, valve stems, bolts, nuts, seats, etc. exposed to corrosion from fresh or sea water and industrial corrosive liquids. Nickel-alloyed yellow brasses of this type are, in general, available from wrought metal sources.

Die Casting and Stamping — The 10 to 15 per cent nickel brasses are used in many applications where appearance is a factor or severe wear and corrosion occur. Plating is unnecessary or undesirable. Typical examples are industrial valves, fittings, hardware, plumbing goods, auto parts, optical instruments, typewriters, office equipment, packaging machinery, conveyor chains, etc.

One of these alloys, Ti-nic-o-sil No. 21 (for die casting), contains: Cu 50, Ni 10, Pb 1, Fe 1, Mn 3, Zn balance; Rockwell B hardness is 75. Ti-nic-o-sil No. 14 (for stampings) contains: Cu 42.5, Ni 15, Zn balance; tensile strength 105,000 psi, yield strength 70,000 psi, and 95 Rockwell B.

Brass for Heat Resistance—An instance in which the aluminum-alloyed nickel brass occurs in industrial service is in the following composition, which might also be classified as an aluminum-alloyed nickel silver: Zn 9-12, Ni 14-16, Al 8-10, Pb 0.25 max, Cu balance, impurities 1.00 max. Brinell hardness is 160-200.

It is a cross-breed mixture of nickel silver with aluminum or aluminum bronze and its hybrid character makes its mechanical properties unpredictable and immaterial. It is primarily employed for its heat resistance in glass-working machinery such as press-molds, plungers and neck rings for bottle molds, etc. It is not suited for hot working. Zinc adds nothing to its heat resistance and it is excelled for such service by the zinc-free aluminum alloyed cupronickels which usually contain 8 to 10 per cent aluminum, 20 to 30 per cent nickel and 60 to 70 per cent copper.

These special nickel brasses again demonstrate the occasional diffusion of nonferrous alloys into each other. Here the yellow brasses, manganese bronzes, nickel brasses, aluminum bronzes and nickel silvers intermingle. A fuller description of the cast nickel silvers and the aluminum bronzes will be dealt with in another text.

In addition to the acknowledgements in the text, credits for assistance are due to Frank Hudson of the Mond Nickel Co. Ltd., London, England, and F. L. LaQue of the International Nickel Co. Inc., New York.

***TABLE VIII (a)—Salt Water Corrosion of Some Experimental Alloys**

Alloy	Salt Water Corrosion Characteristics	Salt Water Fatigue Test, psi	—Ratio to Mn Bronze (OY) = 1.00— Cavitation Resistance	Corrosion-Fatigue Resistance
Red brass	Slight pitting	5,500	.52	.61
Sn bronze	Slight pitting	6,000	.56	.67
Mn bronze	(Taken from a propeller section 9½" thick)			
Mn bronze (OY)	Severe dezincification	9,000	1.00	1.00
Mn bronze (QU)	Dezincified—pitted lightly	9,500	1.52	1.05

***TABLE VIII (b)—Composition of Materials Listed in Table VIII (a)**

Alloy	Cu	Zn	Al	Sn	Fe	Mn	Ni
Red Brass	83.60	14.37	.08	1.64	.36	...	...
Sn Bronze	85.70	6.22	.19	7.58	.33	...	...
Mn Bronze	57.93	39.18	.65	.78	.69	.78	...
Mn Bronze (OY)	57.12	41.00	.62	Nil	1.10	.29	...
Mn Bronze (QU)	48.99	44.90	..	.41	1.12	2.86	1.72

* Data from "Investigation of Materials for Marine Propellers," W. C. Stewart and W. L. Williams, *Proceedings*, ASTM, Vol. 46, 1946, pp. 836-845.

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6. Mousson, J. M., "Pitting Conditions of Metals Under Cavitation Conditions," *Transactions*, American Society of Mechanical Engineers, 1937, Vol. 59, No. 5.
7. Stewart, W. C. and Williams, W. L., "Investigation of Materials for Marine Propellers," *Proceedings*, American Society for Testing Materials, Vol. 46, 1946, pp. 836-845.

TABLE IX—Resistance of High-Strength Bronzes to Cavitation Erosion

Alloy	Yield Strength, psi	Tensile Strength, psi	Elongation, per cent	Bhn	Cavitation Erosion —Loss in mg/hr— Fresh Water	Sea Water
Ordinary manganese bronze	.....	76,200	35.0	116	55	60
Manganese bronze containing nickel	40,300	80,700	20.0	144	40	40
Nickel-aluminum bronze	44,800	89,600	15.0	150	20	15

Note: Tests conducted by vibratory method (Kerr).

TABLE X—Erosion Tests in Sea Water at Kure Beach, N. C.*

Material	Cu	Ni	Al	Fe	Mn	Zn	Sn	Pb	Mdd‡	IPY§
Mn Bronze	56.0	..	1.0	1.38	1.82	Bal.	0.15	...	13.8	.002
Special Mn Bronze	Bal.	5.0	5.32	0.93	0.75	9.72	...	...	9.4	.001
Composition G†	86.9	0.9	...	...	...	2.7	9.4	0.15	233.0	.039

* Average water temperature 30° C, water velocity 27 fps, test duration 60 days. Specimen size: 4 x ¾ x ¼ in. † Not included in same run but tested under identical condition. ‡ Mdd = Mg per sq dm per day. § IPY = Inches penetration per year.

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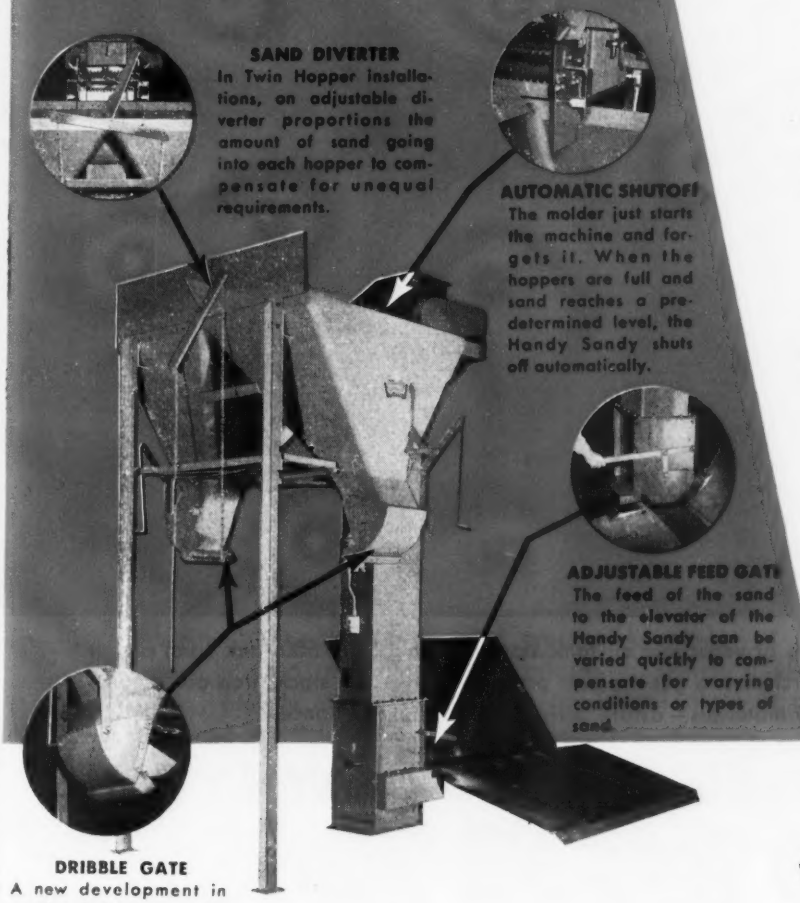

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In Twin Hopper installations, an adjustable diverter proportions the amount of sand going into each hopper to compensate for unequal requirements.

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A new development in overhead hopper gates that eliminates any particles of sand from dropping into prepared mold.

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3. **INCREASES MOLDERS' OUTPUT.** The Handy Sandy removes the shovel from the molder's hand and lets him devote full time to molding. As a result, users have found the output of their molders is increased from 30% to 70%.

4. **SAVINGS FROM THE FIRST UNIT PAY FOR THE NEXT.** You don't have to make a major investment for the Handy Sandy. You can equip one floor at a time — the savings from one unit will help pay for additional units.

5. **IMPROVES CONDITION OF SAND.** A built-in aerator in the Handy Sandy gives the sand added blending, breaks up lumps, and improves the texture. Hand riddling can often be eliminated.

6. **TAKES LITTLE SPACE.** The Handy Sandy occupies no more floor space than the sand pile itself. It can be installed in most any foundry where space is limited. As it requires little headroom, no structural changes are required.

7. **LOW COST — SIMPLE TO INSTALL.** The Handy Sandy is a compact, packaged unit that can be installed in a few hours time. **It requires no expensive overhead conveyors, no pits or foundations.** Its simplified design means low initial and operating costs and dependable performance. It's factory wired.

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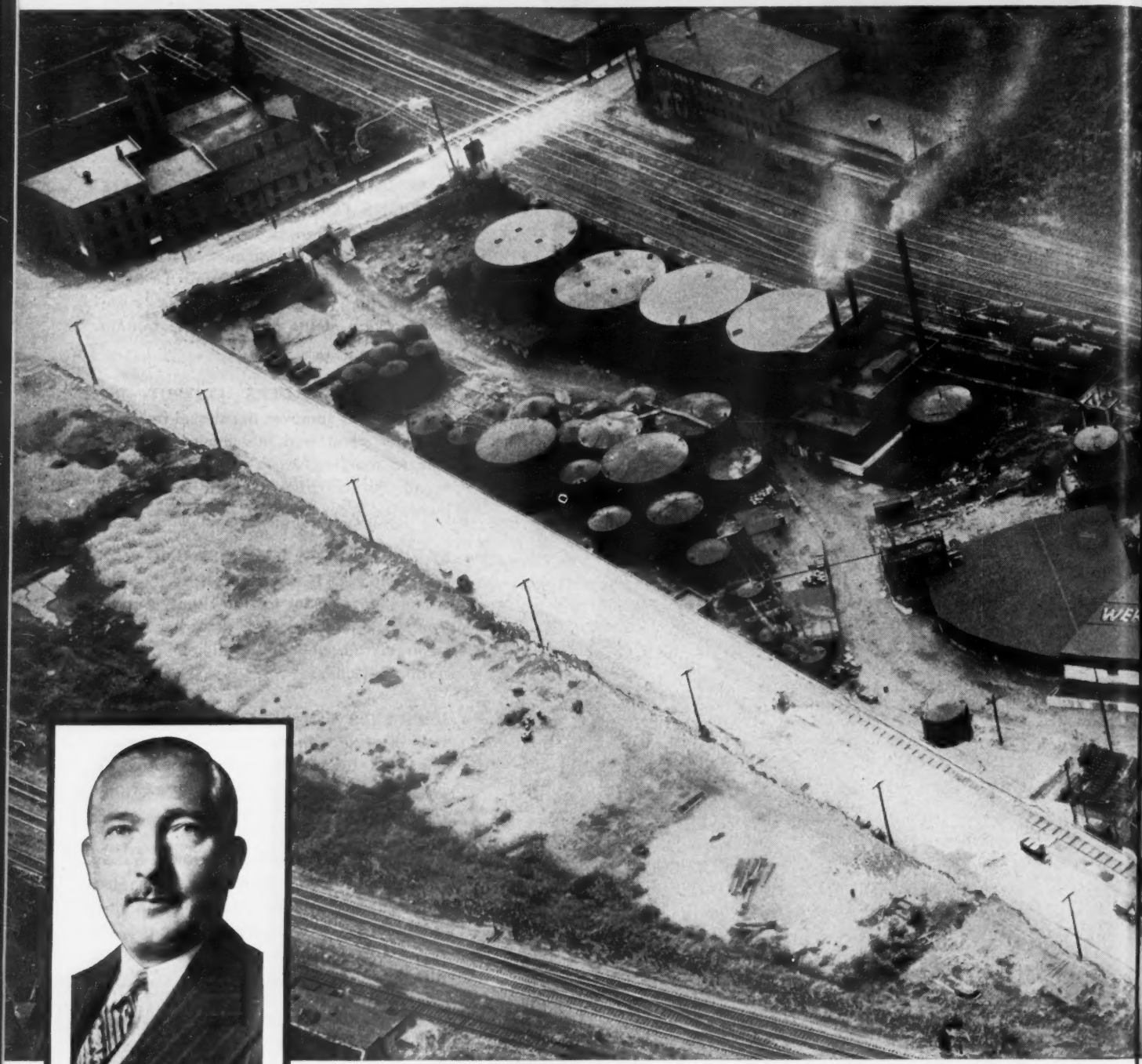

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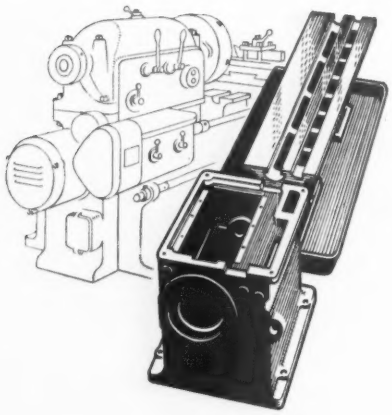

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Modern industries are founded upon the machine tool; no part can be made more accurately than the machine which makes it. A machine tool must be made accurate, and must stay so.

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A typical successful lathe bed casting has 3.10% Total Carbon, 1.25% Silicon, 0.75% Manganese, with 0.50% Nickel and 0.50% Molybdenum added.

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Steelmaking for Castings

(*Continued from page* 109)

generally contain enough carbon to give the steel the proper composition. When the elimination of carbon is continued down to 0.10 or 0.15 per cent, however, the ferroalloys alone will not bring the carbon content to the desired point, and it is necessary to depend upon additions of pig iron to furnish most of it. The pig is charged immediately after the ferrosilicon "block."

In some cases, part of the required carbon is added in the form of petroleum coke or other carbonaceous material, thrown into the stream in the spout as the metal runs into the ladle. Because the amount of carbon absorbed from these ladle additions is apt to vary quite widely, the author has always considered it much better practice to use pig iron in the bath.

The pig iron used in acid practice usually contains about 1 per cent Mn —sometimes as high as 1.50 or even 1.75 per cent—and from 1.50 to 2.50 per cent Si. No phosphorus or sulphur can be eliminated from the metal, and the total amount of the latter even increases slightly because some is absorbed from the fuel. The decrease in total weight of metal in the bath, due to oxidation of carbon, manganese, silicon and iron, makes the percentage of phosphorus and sulphur in the finished steel higher than it was in the material charged. To make steel with no more than 0.04 per cent of each of these impurities, the pig must contain not over 0.035 per cent of each.

Purchased scrap will contain 0.10 to 0.30 per cent C, about 0.50 to 0.70 per cent Mn, and 0.15 to 0.20 per cent Si. The phosphorus and sulphur must be the same as in the pig. At times special grades of scrap, such as rails or pressed steel car wheels, containing higher proportions of carbon, are available.

The several materials are combined in such relative amounts as to make up a charge containing 0.60 to 1.00 per cent C (usually about 0.75 per cent), 0.50 to 1.00 per cent Si, and 0.40 to 1.75 per cent Mn. Practice in different shops varies widely in the amount of manganese in the charge; most operators prefer a content of 0.75 to 1.00 per cent, but some believe it is desirable to make it as high as 1.25 or even 1.75 per cent. To obtain these high figures, special high-manganese grades of pig iron, or additions of manganese alloys are required. The advocates of high proportions of manganese in the charge wish to obtain a slag in which much of the iron oxide is replaced by the MnO produced by the oxidation of the extra manganese. Such slags, they contend, are more fluid and workable, and produce a more thoroughly deoxidized steel than those with lower contents of MnO.

Table I shows the amounts of pig iron, shop scrap and purchased scrap used in a typical steel foundry, to make up a charge of 55,000 lb designed to melt at a low carbon content, and to require no iron ore. In this shop, a special grade of heavy purchased scrap with an unusually high carbon content was obtainable, so that only 10 per cent pig was required to bring the carbon of the charge to the desired percentage. Of late, as already mentioned, petroleum

(*Continued on page* 234)

TABLE I—Typical Metal Charge in a Steel Foundry

Material	Weight, lb	C per cent	C lb	Mn per cent	Mn lb	Si per cent	Si lb
Pig iron	5500	3.85	211.75	1.50	82.50	2.40	132.00
Shop scrap	29400	0.26	76.44	0.70	205.80	0.36	105.84
Pur. "A"	9500	0.26	24.70	0.70	66.50	0.36	34.20
Pur. "B"	10600	0.85	90.10	0.65	68.90	0.36	38.16
Total	55000	0.73	402.99	0.77	423.70	0.56	310.20

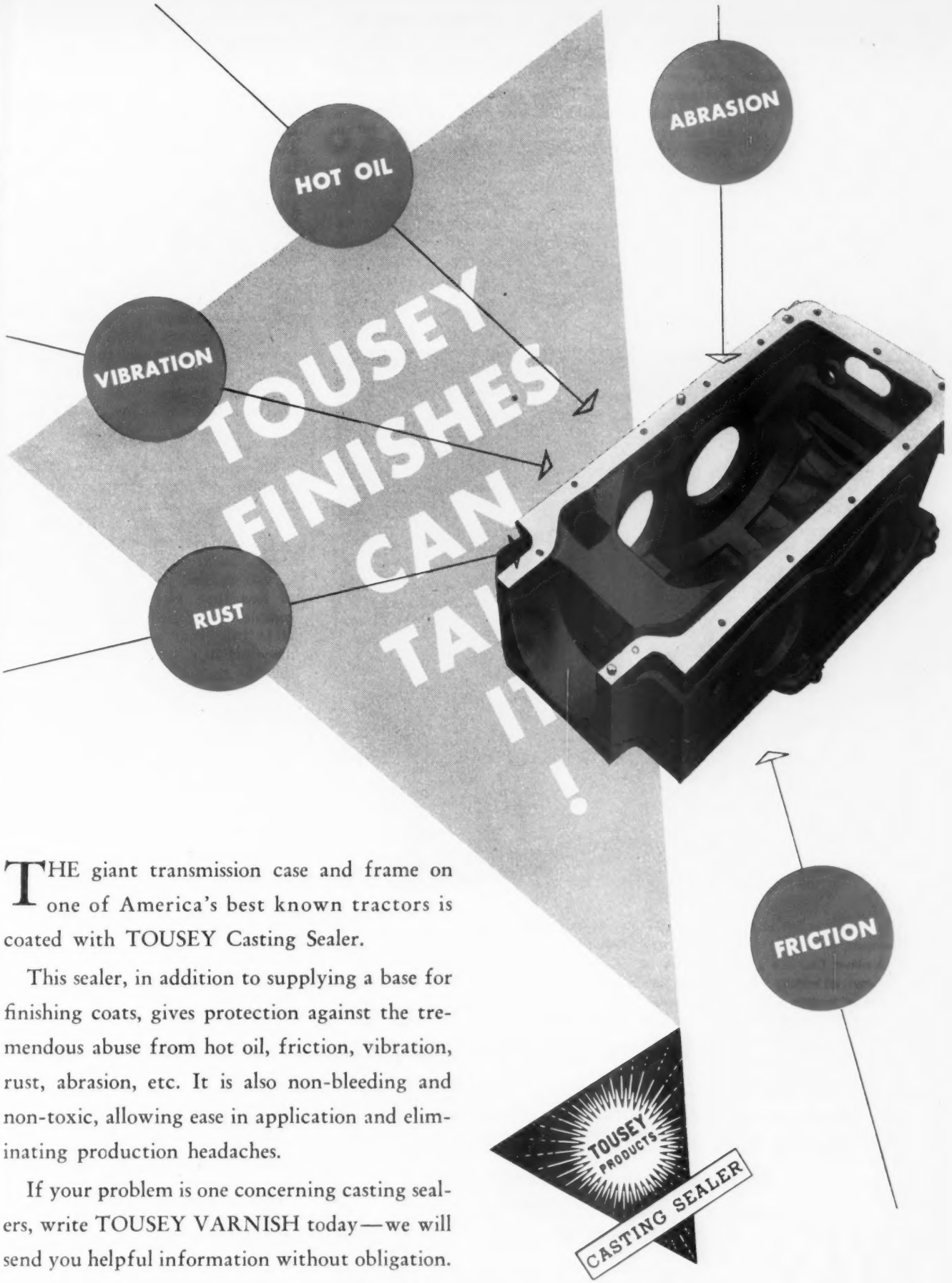
Time	Item	C	Mn	Si	P	S
5.00 A.M.	Started charging					
7.00	Started charging second portion					
9.00	Melted					
9.10	Test No. 1	0.36	0.09	0.072	.033	.036
9.45	Test No. 2	0.30	0.09	0.06		
10.15	Test No. 3	0.22	0.09	0.048		
10.17	Sand charged to increase slag volume					
10.40	425 lb-50 per cent ferrosilicon charged					
10.45	Test No. 4	0.21	0.08	0.37		
10.46	825 lb-80 per cent ferromanganese charged					
10.50	Tapped					
Time of heat 5 hr 50 minutes						
	Final analysis	0.29	0.75	0.37	0.039	0.039

From W. C. Harris, *Transactions*, American Foundrymen's Society, Vol. XLVII 1939, page 277.

TABLE II—Acid Open Hearth Slag Analyses

Condition	SiO_2	FeO	MnO	Fe_2O_3	CaO	Al_2O_3
At melt-down	48.9	34.2	12.2	1.3	1.5	1.8
End of heat	58.2	19.2	10.2	..	8.1	4.0
End of heat*	54.1	13.3	25.8	..	4.2	3.3

* High manganese practice



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(*Continued from page* 232)

coke or graphite is frequently used for the same purpose.

The silica bottom of an acid open-hearth furnace is severely attacked by the iron oxide produced in melting the charge, especially the scrap. Less iron is oxidized, and consequently less iron oxide is produced in melting the pig, because its silicon and manganese content protects the iron from the attack of the oxygen. To minimize the attack on the bottom, therefore, most operators charge the pig first. Having a lower melting point than the scrap, it melts first and soon forms a pool of metal to cover and protect the silica bottom of the furnace. Other authorities prefer to place some of the heavy scrap on the bottom, then charge the pig and top off with the lighter scrap, and still others hold that the pig should be spread evenly over the top of the charge, in order to protect the banks from attack. Whatever the charging sequence, the metal is melted down rapidly with an oxidizing flame, and is at first covered with a fluid slag high in iron oxide, which reacts readily with the carbon to produce a boil.

This oxidizing slag is thin and watery and only a light coating of it sticks to a stirring rod or to the handle of the test spoon. When cooled and broken, it has a shiny black color, due to its high content of FeO. As the boiling of the heat progresses and the iron oxide content of the slag decreases, it becomes heavier and thicker, and its color changes, first to brown, then to yellowish and finally to light yellow or greenish yellow. The higher the content of MnO, the more pronounced the green tint. On the outside, the slag remains smooth and black or dark brown when cooled in water, even when the fractured surface is quite light in color.

Typical analyses[3] of acid open-hearth slags are shown in Table II.

No Ore Required

The charge detailed in Table I illustrates the type of practice in which the metal is melted down with a carbon content only a little above that desired in the finished steel, no ore is required to secure a satisfactory boil, and the heat is finished in less than two hours after it is completely melted. Fourteen points (0.14 per cent) of carbon were oxidized out in a little over an hour, and the boil then subsided of its own accord, as shown by the fact that there was little if any further loss of carbon after the third test, though the ferrosilicon intended to shield it from oxidation was not added until five minutes before test No. 4 was taken.

Allowing approximately 6 per cent melting loss, a fair figure for acid open-hearth operation with not too much light scrap, this heat may be assumed to have weighed some 53,000 lb in the ladle (55,000 x 0.94 = 51,700, plus 1250 lb final additions = 52,950 lb total). On this basis, the silicon added was 42.5 x .50 ÷ 53,000 or 0.40 per cent, and the manganese 825 x .80 ÷ 53,000 or 1.22 per cent. There was a very small loss of silicon, but the drop in manganese content was quite large. Assuming that the steel before final additions weighed 51,700 lb, and analyzed 0.08 per cent Mn, it contained 41.36 lb manganese. Estimating 53,000 lb in the finished heat, it contained 53,000 x 0.0075, or 397.5 lb Mn. Subtracting the 41.36 lb present in the bath leaves 356.14 lb that was derived from the ferromanganese. As the latter contained 660 lb Mn, the loss of manganese was 46 per cent.

To avoid this heavy loss, some operators add only part of the ferromanganese in the furnace, and shovel the rest, crushed to walnut size,

(*Continued on page* 236)

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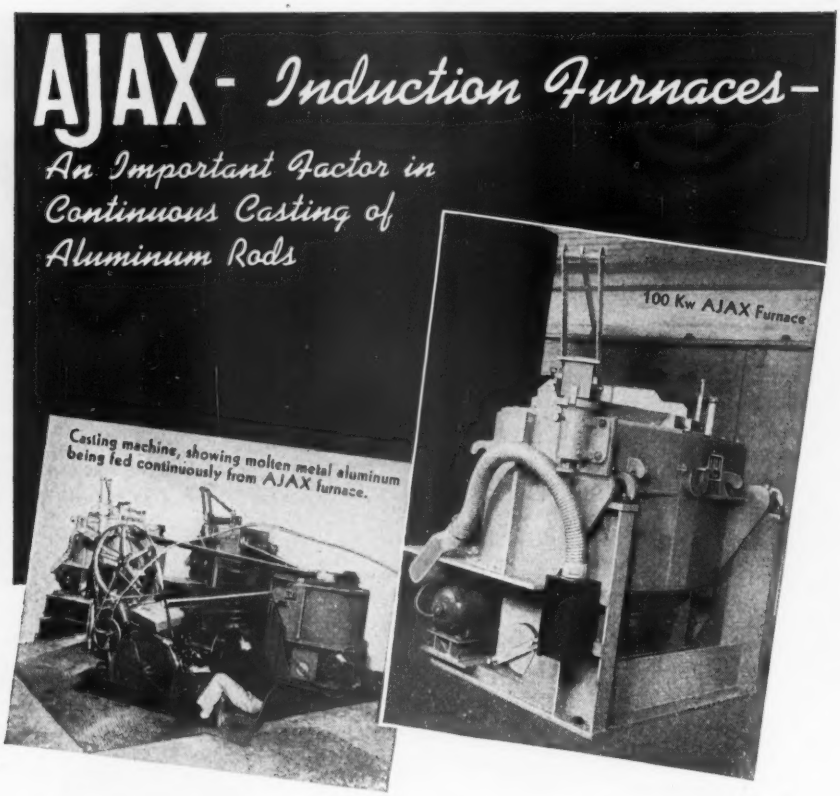

The picture at left above, taken at the Davenport, Iowa plant of the Nichols Wire & Aluminum Co., is a graphic example of the way in which AJAX furnaces are helping in modern methods of production. Three AJAX furnaces, two as melting units and the third acting as a holding furnace, feed a continuous stream of molten aluminum at automatically controlled temperature into a rim cavity on the slowly revolving wheel of the Properzi machine—which produces ⅜" aluminum wire directly from molten metal.

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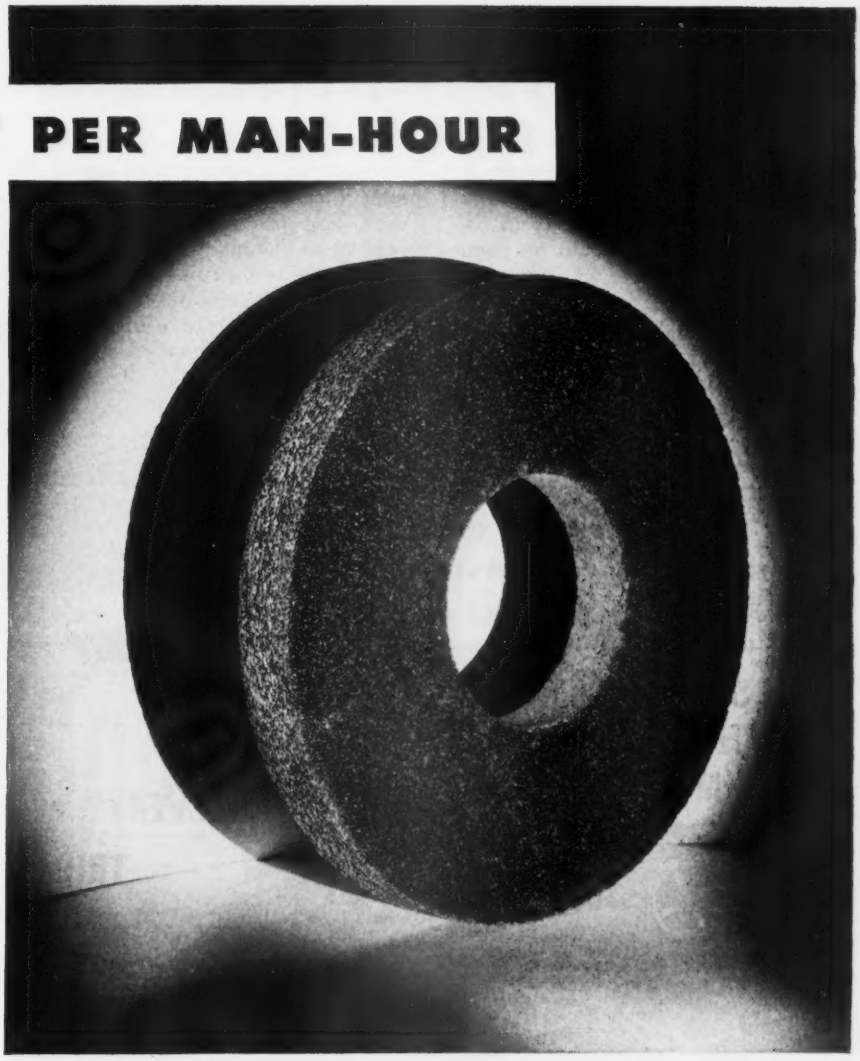

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(*Continued from page* 234)
into the ladle when the heat is tapped. Added in this way, a larger percentage of the manganese is retained in the steel.

The ferrosilicon contained 2.125 lb C (425 x 0.005) and the ferromanganese 53.625 lb (825 x 0.065), making a total of 55.75 lb added. In 53,000 lb of steel, this would be about 0.11 per cent. There was therefore a loss of about 2 points (0.02 per cent) of carbon between the fourth and final tests.

As illustrated in Table I, the silicon content of the bath after the boil is generally from 0.05 to 0.10 per cent; the manganese varies somewhat, depending upon the amount in the charge, but a content of from 0.06 to 0.20 per cent is expected in normal practice. At melt-down, the silicon should not be over 0.20 per cent, and preferably under 0.15 per cent while the manganese varies from about 0.30 to 0.40 per cent with high manganese charges to a low figure of 0.10 to 0.20 per cent when the charge contains lower proportions of manganese.

The heat shown in Table I melted down rather lower in carbon than normally is expected. A fair average of practice in which a low content at melt-down is aimed for would be from 0.20 to 0.30 per cent above that in the finished steel. As mentioned elsewhere, however, in some cases the carbon in the charge is intentionally made high enough to give a melt-down carbon content as much as 0.60 to 1.00 per cent above that of the finished heat. When so much carbon must be eliminated from the steel, the action of the FeO in the slag at melt-down must be reinforced by additions of iron ore. As the reaction between FeO and C is endothermic, the bath should be raised to at least 2750° F before the ore is charged. A boil vigorous enough to eliminate as much as 60 points (0.60 per cent) of carbon per hour is considered acceptable practice when the heat is melted down high in carbon, but a somewhat slower rate is advisable.

In Table III is shown the log of a 145,000 lb heat that melted down at 0.72 per cent C, and required a fairly large addition of iron ore to secure a satisfactory boil. The make-up of the charge, and the silicon and manganese content at different stages of heat, are not given. It may be assumed, however, that either or both of those metalloids at melt-down were on the high side, since the 300 lb of iron ore added at first eliminated only 0.06 per cent C in 35 minutes, and 1000 lb more were required to remove 48 points (0.48 per cent) in the next hour and fifteen minutes. Thereafter the boil must have completely subsided, as the carbon dropped only 3 points (0.03 per cent) more in an additional 27 minutes.

Not only was the heat shown in Table III intentionally melted down at a higher carbon content than that

(*Continued on page* 238)

TABLE III—Log of 145,000-lb Heat

Time	Item	Carbon, per cent
11.10	Started charging	
12.30	Started charging second portion	
5.15	Melted	
5.19	Test No. 1	0.72
5.25	300 lb ore charged	
5.54	Test No. 2	0.66
6.15	1000 lb ore charged	
6.41	Test No. 3	0.39
6.54	Test No. 4	0.30
7.09	Test No. 5	0.23
7.12	500 lb limestone charged	
7.30	Test No. 6	0.18
7.47	Test No. 7	0.17
7.57	Test No. 8	0.15
8.02	1160 lb spiegel charged	
8.12	200 lb burned lime charged	
8.25	Test No. 9	0.19
8.30	1750 lb 80% ferromanganese charged 1160 lb 50% ferrosilicon charged	
8.40	Tapped.	

Ladle analysis: C 0.28%, Mn 0.83%, Si 0.35%. Time of heat 9 hr 30 minutes.

C. W. Briggs, *The Metallurgy of Steel Castings*, page 74.

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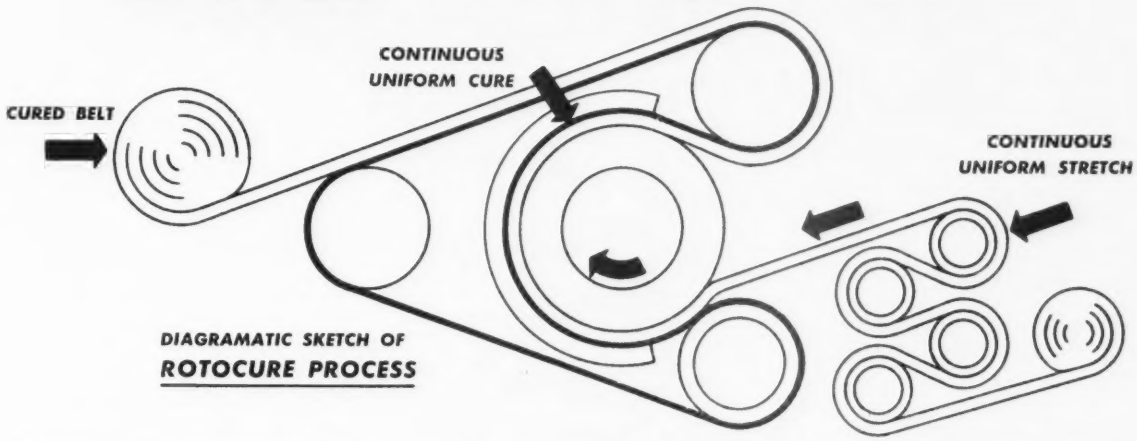

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BWH
DEPENDABLE RUGGEDNESS

(*Continued from page* 236)

illustrated in Table I, so that iron ore was required to create a proper boil, but the elimination of carbon was carried to a considerable lower point. In handling both heats, however, the boil was allowed to die out completely before the blocking additions were made.

Another difference in the practice illustrated in the two tables is in the material used as a block. The heat of Table I was blocked with ferrosilicon. Many operators prefer this material or a silicomanganese alloy, because silicon has a greater affinity for oxygen at the prevailing temperature than manganese does. The silicon eliminates most of the FeO that would greatly increase the loss of the more costly manganese, if the latter were added first. Instead of silicomanganese, some acid open-hearth men prefer to add ferrosilicon and ferromanganese simultaneously.

The heat shown in Table III, on the other hand, was blocked with a manganese alloy, and ferrosilicon was used only as a final addition. Being a high-carbon material, this spiegel block not only stopped the oxidation of carbon, but raised the carbon content of the steel by four points (0.04 per cent), as shown by the results of tests Nos. 8 and 9.

The addition of limestone or burned lime to the slag, as shown in Table III, is a practice favored by some operators. The CaO of the addition increases the fluidity of slags low in MnO, and also replaces some of the FeO in the complex FeO. MnO. SiO_2 slag, so that more of the FeO is free to react with the carbon of the steel. Adding lime, therefore, has somewhat the same effect as charging ore; in this heat, the drop of some 8 points (0.08 per cent) C after the limestone was charged, as shown in tests Nos. 6, 7 and 8, was undoubtedly due in part to this action of the CaO.

In acid open-hearth practice, the slag is essentially an iron-manganese silicate containing roughly 50 to 60 per cent SiO_2, the remainder being FeO and MnO, with only minor amounts of lime or magnesia, whereas in basic operation the two latter predominate. Basic slags are lime-iron oxide-manganese oxide silicates, in which the ratio of lime to silica is intentionally maintained at from 2 to 1 to as high as 3 or even 3½ to 1. In steel foundry work, 2½ to 1 is probably a fair average figure, the lime being raised to give higher ratios when the phosphorus in the raw materials is on the high side.

Typical Basic Slags

Briggs gives the following figures for basic slag compositions in steel foundry operation: CaO 40 to 50 per cent; SiO_2 13 to 18 per cent; MnO 7 to 15 per cent; and FeO, 12 to 16 per cent. Because of absorption from the furnace bottom, 5 or 6 per cent MgO and minor amounts of A1203 and Fe_2O_3 are also present.

With slags of this nature, considerable amounts of phosphorus can be retained in solution as P_2O_5, whereas in the acid process if any P_2O_5 were formed it would be reduced immediately by silicon, and the phosphorus would re-enter the steel. The basic process therefore eliminates much of the phosphorus in the raw material. To be sufficiently oxidizing to remove phosphorus in this way, a basic slag should contain at least 12 per cent FeO.

To secure a proper slag, either limestone or burned lime is added with the metallic charge. The CO_2 evolved from limestone produces a vigorous "lime boil" and oxidizes some of the carbon out of the metal. When burned lime is used, no lime boil occurs, and the carbon of the

(*Concluded on page* 240)

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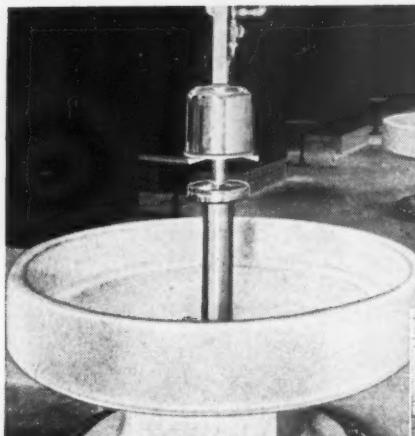

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ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

How VANADIUM improves engineering steels and helps conserve critical alloys

In these critical times when many alloying materials are scarce, you may be able to use vanadium to good advantage. Steels alloyed with vanadium meet most of the mechanical specifications for low-alloy engineering and structural steels. In fact, vanadium can often be used in engineering steels to replace at least part, if not all, of certain alloys now in critical supply.

The metallurgy of vanadium is well known. Small additions of vanadium—0.10 to 0.30 per cent—can be used effectively to give steel extra strength, toughness, and resistance to fatigue and wear. It improves engineering steels by increasing their yield strength without sacrificing ductility. The uniformly fine grain size of vanadium-bearing steels makes them tough and resistant to abrasion, fatigue, and impact.

Better Mechanical Properties

In the following table are typical analyses for carbon-vanadium and chromium-vanadium steels that are suitable for most applications where low-alloy, high-strength steels are required. The carbon-vanadium steel is compared with plain-carbon steel; and the chromium-vanadium steel, with chromium-molybdenum steel. Note the excellent properties of the vanadium-bearing steels.

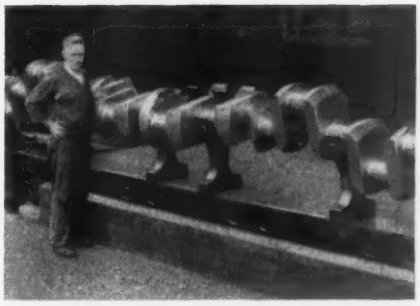

Fig. 1 — Vanadium increases the strength, toughness, and wear resistance of engineering steels for many machine parts, such as this large crankshaft.

Improves Cast Iron

A small addition of vanadium, usually from 0.10 to 0.25 per cent, refines the grain of cast iron, and materially increases its strength and hardness. Moreover, vanadium may be used in cast iron to replace at least part, if not all, of certain alloys that are now in short supply.

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An addition of approximately 1 lb. of vanadium per ton of steel produces non-aging characteristics in a rimmed steel. These non-aging properties, together with improved deep-drawing characteristics and the good surface inherent in rimmed steels, make these steels of particular interest at the present time.

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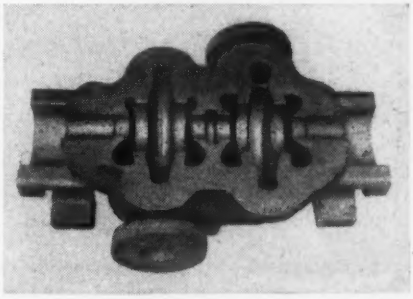

Fig. 2—Steel and iron castings treated with small additions of vanadium have high ductility and greater toughness and impact resistance.

Write for a copy of the booklet, "ELECTROMET Ferro-Alloys and Metals," which gives helpful information about the use of ferrovanadium and other alloying metals that ELECTROMET supplies. The booklet may be obtained from any ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

Properties of Vanadium Steels Compared With Other Engineering Steels

Typical Analysis, %	Carbon Steel	Carbon-Vanadium Steel	Chromium-Molybdenum Steel	Chromium-Vanadium Steel
Vanadium	—	0.16	—	0.16
Carbon	0.50	0.49	0.50	0.50
Manganese	0.71	0.77	0.80	0.79
Silicon	0.19	0.15	0.30	0.31
Chromium	—	—	0.95	0.98
Molybdenum	—	—	0.20	—
Annealed and Furnace-Cooled				
Tensile Strength, psi	90,600	100,000	100,000	99,500
Yield Point, psi	48,900	66,000	50,000	64,100
Elongation in 2 in., %	23.3	25.0	23.0	28.4
Reduction of Area, %	37.8	49.1	45.0	59.0
Izod Impact, ft.-lb.	13.5	26.0	17.0	44.0
Quenched and Tempered				
Tensile Strength, psi	134,900	134,500	232,000	232,800
Yield Point, psi	110,800	128,000	214,500	224,200
Elongation in 2 in., %	18.3	18.3	10.0	10.4
Reduction of Area, %	54.1	56.6	39.0	43.1
Izod Impact, ft.-lb.	54.0	65.0	12.0	12.0

The term "Electromet" is a registered trademark of Union Carbide and Carbon Corporation.

(Concluded from page 238)

charge therefore can be lower than when some is lost by oxidation with CO_2. Since burned lime is absorbed by the slag easier and faster than limestone, most foundries use the latter only when burned lime is unobtainable.

The amount of burned lime required usually varies from 4½ to 6 per cent of the weight of the metal charge. When a large proportion of the scrap is light, so that more than the usual amount of FeO is produced in melting it, the lime addition may be as high as 7 per cent of the weight of the charge.

Briggs[5] gives the composition of a satisfactory burned lime as follows: Loss on ignition 2 per cent maximum; SiO_2 1 per cent maximum; Fe_2O_3-Al_2O_3 1.5 per cent maximum; MgO 1.5 per cent maximum, and CaO, 95 per cent.

Raw Materials—Phosphorus in basic pig iron is usually between 0.2 and 0.4 per cent. With lake ores it varies between 0.1 and 0.35 per cent, while when southern ores are smelted, the phosphorus is as high as 0.75 to 0.90 per cent. A maximum of 0.3 per cent is desirable. The sulphur should not be over 0.06 per cent, and preferably between 0.025 and 0.05 per cent. The silicon content runs from 0.75 to 1.25, and should be as low as possible, because the SiO_2 produced by its oxidation must be neutralized by lime, so that the higher the silicon in the pig the more lime must be charged. One pound of silicon gives about 2 lb of SiO_2 and requires 5 lb of lime to secure a 2½ to 1 lime silica ratio in the slag.

The manganese should be from 1.50 to 2.25 per cent. A higher content gives a slag which contains more MnO and is more workable than that produced from low-manganese charges. A high manganese content is also desirable because it promotes the elimination of sulphur from the metal by the formation of MnS, which rises out of the bath, and is taken up by the slag. Some of it is held in solution in the slag, and some is oxidized to SO_2 and carried off with the waste furnace gases. Not a great deal of sulphur can be eliminated from the steel, however, and the content in the charge should not greatly exceed that specified in the finished steel.

Scrap for the basic process may contain much more phosphorus than the more expensive "low phosphorus" grade required for use in acid furnaces. As an increasingly large proportion of the steel scrap now available in this country was made by the basic open-hearth process, much of it contains less than 0.04 or 0.05 per cent phosphorus. A good deal of bessemer steel containing as much as 0.12 is still finding its way back to the mills as scrap, and small amounts of wrought iron containing 0.2 to 0.3 per cent phosphorus will be found in many cars of scrap.

(To be concluded next month)

References

3. C. W. Briggs, *Metallurgy of Steel Castings*, pp. 75, 76
4. C. W. Briggs, *Metallurgy of Steel Castings*, p. 33
5. C. W. Briggs, *Metallurgy of Steel Castings*, p. 7

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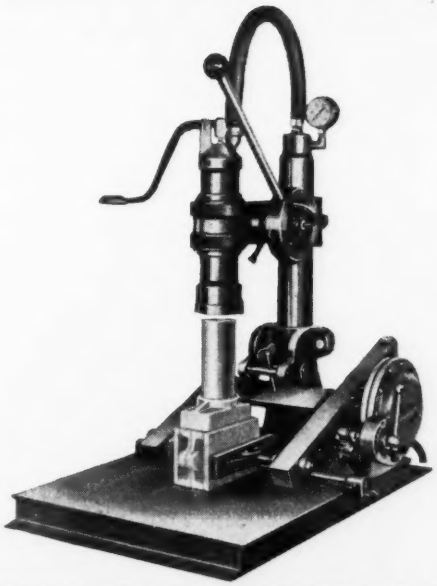
REDFORD *No. 2 Stationary Magazine Type* CORE BLOWER



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Illinois Foundry Industry Described in Book

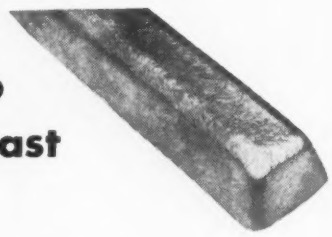
Bureau of Economic & Business Research, Urbana, Ill., University of Illinois, has published a reference work on the foundry industry in Illinois. It analyses current operations as well as prospects for future development of the industry. Entitled "The Foundry Industry in Illinois" the book was written by Harry Czyzewski, assistant professor of physical metallurgy at the university, and Burton C. Person, metallurgist, Esso Standard Oil Co.

The authors have attempted to determine the degree to which Illinois foundries have made use of developments in mechanization, captive vs. jobbing organization, geographical and industrial distribution of markets, and technical control and development work.

The authors conclude that product improvement is a serious need in the foundry industry. They expect Illinois to continue as the third ranking state in number of foundries and amount of production, but they see a change in the state's distribution of foundries with more foundries in areas outside the Chicago metropolitan district along main waterways and principal railroad lines.

Markets for foundry products among the various industries may become more widely distributed than at present. The high degree of skill required of foundry production personnel, however, will limit to some extent the development of foundries in new areas. The authors advocate reducing the degree of skill required by simplifying foundry procedures and developing technical controls independent of the production labor.

How to Sand Cast



BERYLCO BERYLLIUM COPPER

Why beryllium copper? Berylco casting alloys are specified where high strength and hardness, good conductivity and excellent resistance to wear and corrosion are important. The heat-treatable feature of these materials offers property combinations not otherwise available. Significant foundry advantages include unexcelled fluidity and low pouring or handling temperatures.

Which Berylco alloy? Berylco 20C is an alloy of broad application with emphasis on strength and wear resistance. Berylco 275C, another high-strength alloy, is especially designed for plastics molds. For applications where electrical and thermal conductivity are more important than strength, Berylco 10C is generally specified. Berylco 50C, which more than meets the requirements of RWMA Class 3, is a special purpose alloy for resistance welding, featuring good resistance to sticking and heat checking.

Sand casting practice. Molding and casting procedures follow accepted bronze techniques. Electric, coke, oil or gas furnaces can be used with good results, while special fluxes or deoxidizers are generally not necessary.

Processing Berylco castings. In contrast to other materials approaching the hardness of beryllium copper, the high strength Berylco alloys can be machined in the soft or annealed condition, then hardened by means of a simple low-temperature heat treatment. The high conductivity Berylco alloys are readily machinable in the fully heat-treated condition.

OUR CASTING SPECIALISTS WILL BE GLAD TO CONSULT WITH YOU ON ANY OF YOUR FOUNDRY PROBLEMS. WRITE TODAY.

Send for "Designing with Beryllium Copper Casting Alloys."

ALLOYS AVAILABLE IN 5 LB., 2½ LB. AND 3 OZ. INGOTS

Properties of Berylco Beryllium Copper Casting Alloys

Annealed and Heat Treated Properties	Berylco 20C	Berylco 275C	Berylco 10C and 50C
Tensile Properties			
Ultimate Tensile Strength	150-175,000	140-165,000	95-120,000
Proportional Limit (0.002% Offset)	105-125,000	85-115,000	45- 65,000
Yield Strength (0.20% Offset)	120-155,000	110-125,000	55- 85,000
Elongation % in 2 in.	1-5	1-5	5-15
Rockwell Hardness	C40-45	C42-48	B92-100
Electrical Conductivity, %	20-25	18-23	45-50

BERYLCO THE BERYLLIUM CORPORATION

DEPT. F, READING 8, PENNSYLVANIA

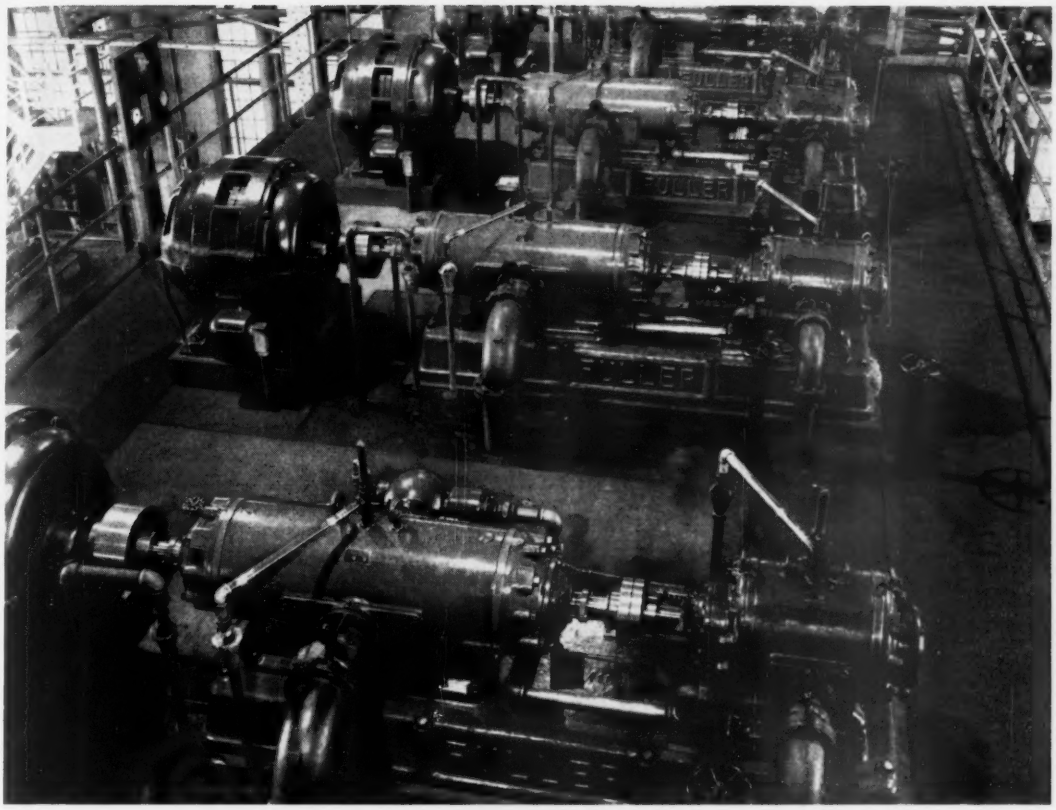
Metals Casting Conference Date Is Set

Annual Metals Casting Conference, sponsored by Purdue University and Michiana and Central Indiana Chapters of the American Foundrymen's Society, will be held Nov. 1-2 at the university, West Lafayette, Ind., Robert Spurgin III, Swayne, Robinson & Co., Richmond, Ind., is conference chairman, and L. D. Reiff, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., is program chairman.

The convention committee includes: Purdue: Profs. R. W. Lindley, M. M. McClure, C. T. Marek, and H. A. Bolz. Michiana Chapter: Mr. Reiff; W. O. Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich.; Roy Payne, Sterling Brass Foundry, Elkhart, Ind., and V. S. Spears, American Wheelabrator & Equipment Corp., Mishawaka, Ind. Central Indiana Chapter: Mr. Spurgin; James Barrett, National Malleable & Steel Castings Co., Indianapolis; E. G. Richardson, Delco Remy Division, General Motors Corp., Anderson, Ind., Carl Schopp, Link-Belt Co., Indianapolis, and S. F. Swain, Golden Foundry Inc., Columbus, Ind.

Booklet Covers Foundry Health Hazards

Results of a study on the health of ferrous foundrymen in Illinois are presented in publication 31 offered by the Superintendent of Documents, U. S. Government Printing Office, Washington 15, for 75 cents. Conducted by the U. S. Public Health Service and Illinois Department of Public Health, the survey covered exposures of ferrous foundry workers to silicosis and other hazards. The report presents clinical and environmental findings of the investigation, which was conducted over a one-year period.



Four two-stage rotary compressors installed in a steel processing plant. Capacity each 1665 c.f.m., 100-lb. pressure.

WHEN WE SAY "A FULL LIFETIME OF NEW MACHINE EFFICIENCY" WE MEAN IT! FULLER ROTARY COMPRESSORS

Fuller has been building rotary compressors for industry for many years. In that time Fuller Compressors have earned a solid reputation for complete dependability under all operating conditions and in all sorts and kinds of locations.

That's because Fuller Compressors are engineered to have a full lifetime of new machine efficiency and reliability. They have a minimum of moving parts—rotor, bearings, and blades. Blades automatically compensate for wear—there are no valves to leak or seats to grind—no need for frequent inspection and servicing.

That's why Fuller Rotary Compressors are ideal units to use in out of the way or isolated locations. You can spot them where you need them—and always be sure they'll be on the job, tirelessly and dependably.

If you're interested in more efficient and economical operation, we suggest you get in touch with a Fuller engineer. And for your files, why not write for Bulletin C-5, which describes and illustrates Fuller Rotary Compressors in detail?

FULLER COMPANY, Catasauqua, Pa.
120 So. LaSalle St., Chicago 3
420 Chancery Bldg., San Francisco 4

Pressures to 125 psig.
Capacities to 3300 cfm.

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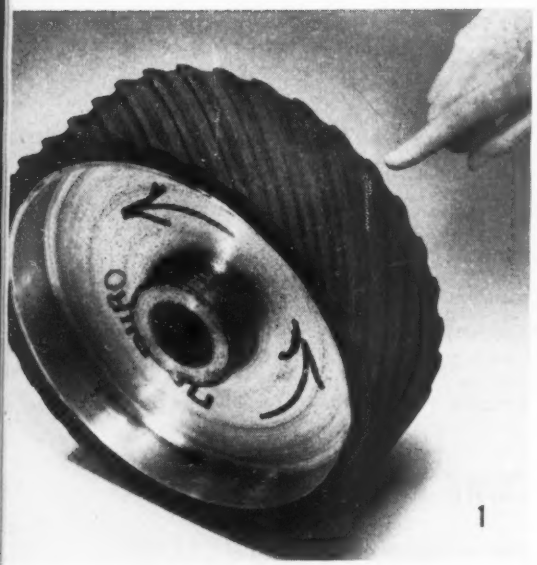
COMPRESSORS AND VACUUM PUMPS
FEEDERS AND ASSOCIATED EQUIPMENT

C-199

New EQUIPMENT *and Supplies*

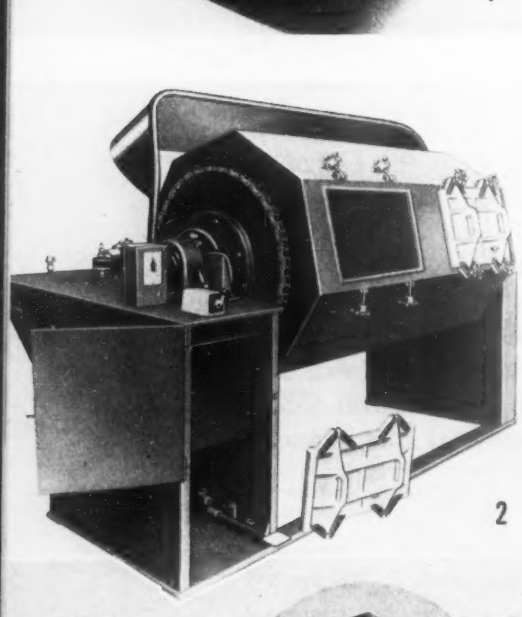
For Additional Information on these Items Use Reply Card—Page 247



1

(1)—Contact Wheel: Carborundum Co., P. O. Box 337, Niagara Falls, N. Y.—New type contact wheel for abrasive belt application on backstand idler applications is said to permit high production in those operations where glazing normally occurs from a standard abrasive belt. New wheel has a specially serrated rubber face that causes controlled breakdown in the bond of the abrasive belt. Glazing is reduced to such a degree that belt life is doubled, it is claimed. Serrated face of the new wheel has relief angle, wide-spaced, narrow lands, based on the design of milling cutters. This design is said to be responsible for increased belt life and cutting rates.

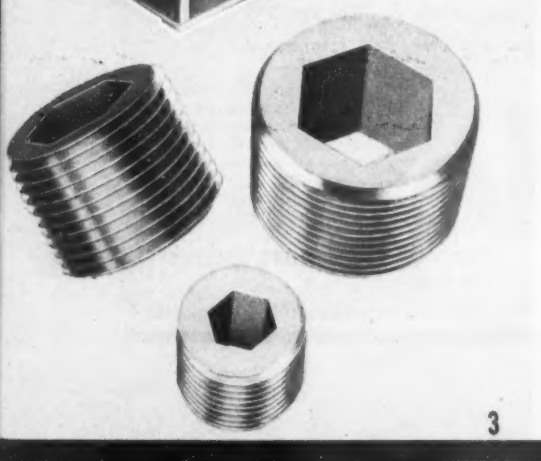
For More Details Circle No. 1—Page 247



2

(2)—Tumbling Barrels: D. J. Murray Mfg. Co., Wausau, Wis.—Tumbling barrels with motor and operating mechanism totally enclosed are made for operation at constant or variable speeds. The 7½-hp, constant speed model that operates at 25 rpm is illustrated. The variable speed, 7½ hp model has speeds from 8 to 25 rpm. Infinite speed changes may be made while the barrel is in motion with no changes of belts or pulleys, it is claimed. Limit switch permits operation only when the hood is closed. Foot operated hydraulic brake at floor level stops the barrel in any position, facilitates loading and unloading, and prevents accidental dumping of loads. Constant and variable speed models of 3 and 5 hp also are available.

For More Details Circle No. 2—Page 247



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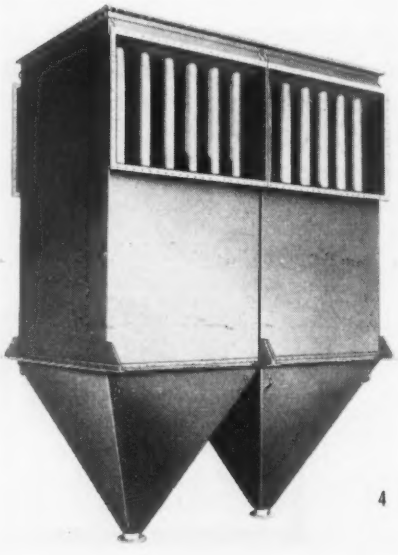


4

(3)—Bushings: Martin Engineering Co., Kewanee, Ill.—Bushings for use in core blowing operations are made of oil and abrasion resistant rubber. They can be adjusted to meet an uneven or wedge shape core box and are designed to minimize blow plate abrasion. With the recent addition of several new sizes the bushings are available in three outside dimensions with the following hole sizes: $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, and 1 in.

For More Details Circle No. 3—Page 247

(4)—Dust Precipitators: American Blower Corp., 8111 Tireman Ave., Detroit 32—Centrifugal type dust precipitators are designed to handle fly ash, cinders and industrial dusts. Units are built in a range of standard sizes ranging in capacity from 5000 to 200,000 cfm with two basic arrangements and can be modified to fit special requirements. Design of the units is said to simplify field erection as they can be shipped in factory assembled sections which are match-marked for final erection and assembly.

For More Details Circle No. 4—Page 247

Cylinder Mounting: Miller Motor Co., 4027 North Kedzie Ave., Chicago 18—Installation of air and hydraulic cylinders without actual pipe connections is said to be possible with a machined flat surfaced mounting plate or manifold on which cylinders are mounted with their ports mating in alignment with the mounting plate ports. Ring seals at the

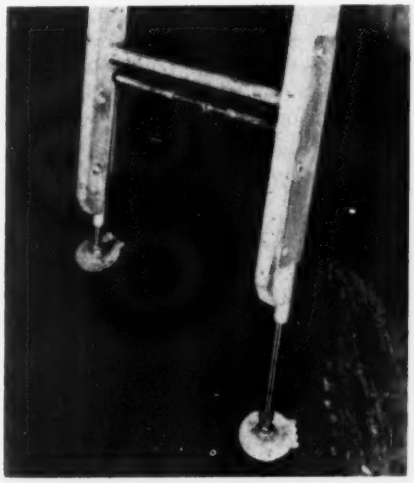
mating surfaces of the cylinder ports provide a leakproof seal under pressure and suction and conform to J. I. C. hydraulic standards. The ring seal is preassembled into the cylinder port and removal and replacement of cylinders on the mounting plate are accomplished by removing or inserting bolts or screws.

For More Details Circle No. 5—Page 247

Recorder: Leeds & Northrup Co., 4917 Stenton Ave., Philadelphia 44—Electronic recorder features a range continuously adjustable over a 20:1 ratio, and zero suppression adjustable over more than twice the maximum range. Through use of a particular suppressed zero range, an operator can ignore that portion of the range in which he is not interested, while he spreads the few millivolts he wants to watch across the entire width of the instrument chart. Adjustable range permits the user to select his own scale calibration at will. Typical applications include: Measurements with strain gages, temperature difference measurements with thermocouples, and speed measurements.

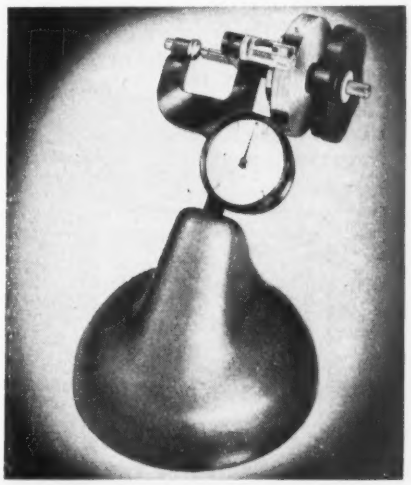
For More Details Circle No. 6—Page 247

Ladder Stabilizer: Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8—Hydraulic ladder stabilizer for the lower end of straight or flare base ladders is an adjustable steel attachment designed to provide footing for ladders in uneven places. It fits ladders 17 to 29 in. wide. Assembly consists of two steel legs which act as plungers in vertical tubes attached to the lower ends of ladder rails. Each leg has a 3½ in. diam, rubber soled, steel, swiveled shoe attached to its lower end by a ball and socket joint. For use on soft or slippery footing, the steel plate has four sharp teeth which, when the shoe is rotated and turned flat to the ladder rails, dig into the surface. Vertical tubes housing the legs are cross-connected near their upper ends by steel telescoping valve tubes leading to a central valve block. Entire assembly above the plungers is filled with oil. Opening the valve permits oil to move from one side of the system to the other. When one leg moves up to adjust itself automatically to a difference in level, the other leg moves down a corresponding distance. When the valve is closed, legs are locked in position. Loads up to 1000 lb are said to be supported by the assembly.



For More Details Circle No. 7—Page 247

Carbon Tester: Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4—Carbon in mild steel baths is said to be determinable in less than one minute by the melters carbon test. Under the controlled conditions of the test, a hardness tester graduated in per cent carbon gives carbon results to within 0.02 per cent in the 0.05 to 0.45 per cent carbon range. Test may be applied to any nonaustenitic molten steel up to 0.060



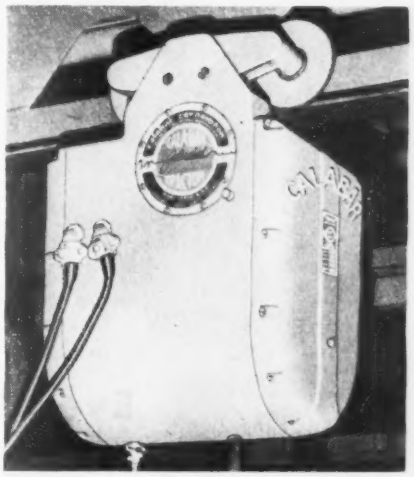
per cent carbon. Equipment is designed to give long service directly on the melting floor.

For More Details Circle No. 8—Page 247

Envelope: American Kleer-Vu Plastics Inc., 58 Thames St., Brooklyn 6, N. Y.—Job ticket envelope is made of noninflammable, 0.005 or 0.0075 gage all new cellulose acetate. Edges are protected with pyroxilin tape, sewed all around. Envelope measures 10½ x 12 in. Strap hangers, grommets and special backings can be added at small additional cost.

For More Details Circle No. 9—Page 247

Monorail Tractor: Calabar Corp., 8414 Otis St., South Gate, Calif.—Fluid tractor is equipped with a magnetically operated clutch which engages the drive wheel when power is on and disengages, allowing tractor to roll freely, when power is off. Thus a tractor-propelled load can be spotted quickly by hand without "jogging." Tractor is available with ½ or ¾-hp, three-phase electric motors operating at 1750 rpm. It fits any track with flat or tapered tread from 2 to 6¼ in. Tractor is designed to move loads up to 5 tons.

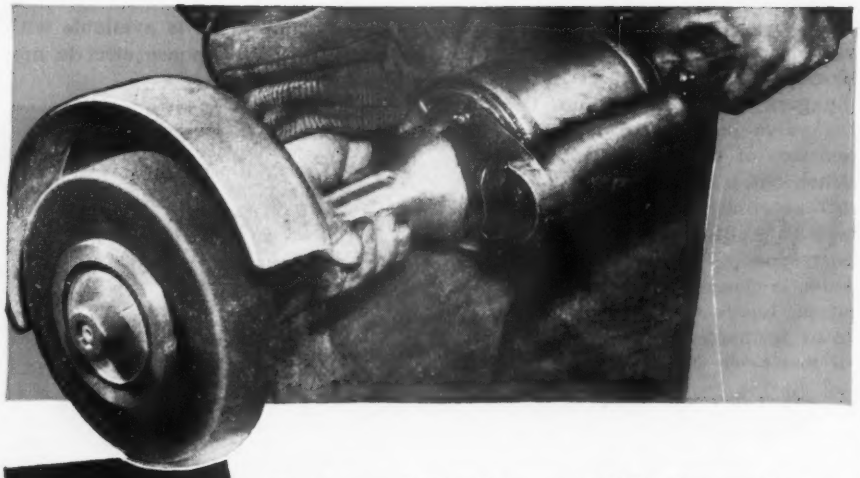


For More Details Circle No. 10—Page 247

Bandsaws: Tyler Mfg. Co., 1005 West Arbor Vitae, Inglewood, Calif.—New 15-in. bandsaws provide speed ranges from 80 to 5000 fpm. A speed indicator shows blade speed at a glance. The infinite speed mechanism is said to eliminate belt changing or gear shifting. A blade tracking arrangement utilizing a large yoke places the pivot point of the upper band wheel at top center of the wheel and is said to assure perfect alignment with the bottom wheel at all times. A vernier-like control for top wheel permits adjustment to hairline accuracy, it is claimed. Entire upper band wheel assembly of the unit is mounted on a steel tube and is adjustable vertically 4 in. Bandsaw is mounted on an integrally cast base. The 16½ x 17-in. table is of precision ground cast iron box construction and tilts 45 degrees right and 5 degrees left. Special guides are supplied with each saw to provide easy changeover for use of spiral blades or conventional flat blades.

For More Details Circle No. 11—Page 247

Fuel Control: Wheelco Instruments Co., 847 West Harrison St., Chicago—Control device is designed to anticipate the fuel needs of controlled heating equipment. By anticipating the heat transfer lags, it automatically reduces to a minimum the on-off variations of a control instrument above and below the preset control point. The device may be used to add the equivalent of proportioning control to any type of heating equipment with conventional "on-off" control. Unit operates through



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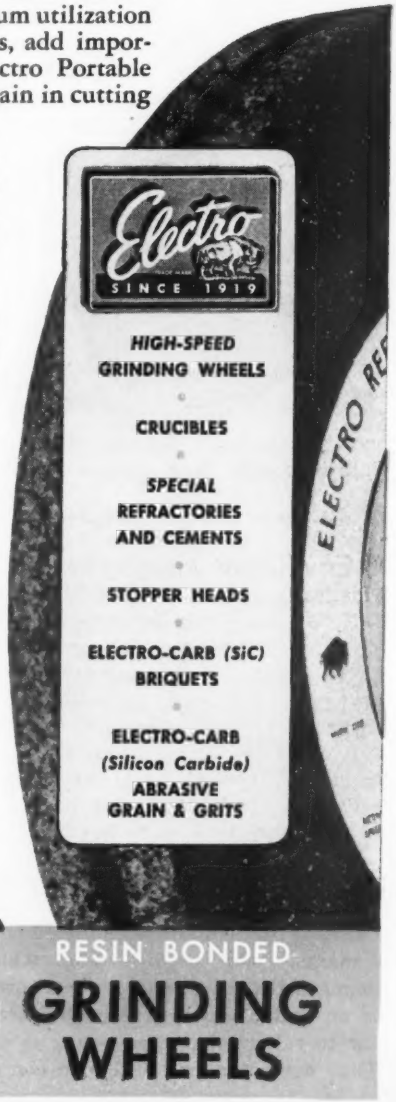
Fractional improvements made possible by producing our own abrasives in our Canadian Electric Furnace Plant, coupled with maximum utilization of new developments in resin bonds, add importantly to the cutting speed of Electro Portable Grinding Wheels; with a resultant gain in cutting quality.

Let us send a Field Engineer to show you how these new wheels can help you meet the renewed pressures for quality production in quantity.

When you work with Electro Wheels engineered to the job in hand, you'll find you are working with a definite advantage. Whether your requirements are for wheels to run in floor stands or swing frames, or for cutting-off, rough or precision grinding, let us show you how much you can gain by using wheels of the right compositions, shapes and sizes.

Request for job-side cooperation places you under no obligation whatever. Write, wire or phone. We will get a Field Engineer to you quick!

Electro Refractories & Abrasives Corp.
344 Delaware Ave., Buffalo 2, N. Y.
West Coast Warehouse, Los Angeles
Canadian Electric Furnace Plant, P. Q.

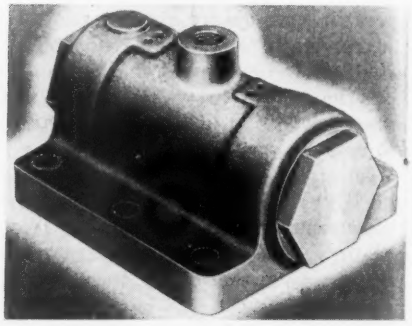


Electro HIGH-SPEED RESIN BONDED GRINDING WHEELS

an electrical circuit and is available as a small self-contained unit or as a built-in feature of electronic controllers and strip chart recorders.

For More Details Circle No. 12—Page 247

Vibrators: SPO Inc., 6449 Grand Division Ave., Cleveland 25—Cradle-mounted pneumatic vibrators may be installed parallel or at right angle to direction of material flow. They are recommended for permanent installation on conveyors, hoppers, screens, benches, chutes, tables, and other types of materials handling equipment. Vibrator bodies are one piece cast steel and are attached by four or six bolts. Bolt holes can be



to any specified diameter and positioned to meet installation requirements. Vibrators have corrosion-proof bronze alloy cylinder liners which are said to assure proper lubrication, full-power starting, high-speed operation and maximum service life. They are available in 1½-in. piston diameter size. Overall length is less than 6 in.; distance across mounting face is 4¾-in., and overall height is 3 in. Mounting base is ⅝-in. thick. Operating speed is regulated by varying the air line pressure. Air intake is standard threaded ¼, ⅜ or 9/16-in. opening. The company also has introduced a heavy-duty series of vibrators suitable for a wide range of applications.

For More Details Circle No. 13—Page 247

Oil Pumping: Drying Systems Inc., 1800 Foster Ave., Chicago 40—Oil level control unit is designed for pumping, preheating, and circulating oil on industrial oil burner systems. It operates as a local circulator and holds about 12 gal of oil which must be replenished from the main source by an external pump or other means. An electric valve in the oil supply connection on the unit opens to admit oil when the level in the tank drops, and closes when the normal level is reached again. Oil is circulated between the unit and burners by a gear type pump of 150-gph capacity and driven by a ¼-hp direct-connected motor. Unit can be furnished with or without heating de-

(*Continued on page* 250)

IDEAS for FOUNDRYMEN

AVAILABLE FOR THE ASKING—This reader-service is designed to provide foundrymen with "idea" and reference material. Listings are selected from company product literature and reprints of special FOUNDRY editorial articles.

50. Time To Wash Up!

Bradley Washfountain Co.—Bulletin No. 25A and also one on "Washroom Layouts" gives good idea of how people can wash together in harmony and save time doing it. Illustrates several types of wash and drinking fountains. The facsimile blueprints are very interesting.

51. Foundry Equipment

Sterling Wheelbarrow Co.—56-page illustrated catalog No. 60A presents complete specifications on line of foundry equipment which includes flasks, flask parts and accessories, wheelbarrows and wheels, hand trucks and carts and industrial casters. Wide range of sizes and types of wheelbarrows is available for handling various materials.

52. Ladles, Ladles, Ladles!

Industrial Equipment Co. will send you a 50-page catalog No. 35 on their line of ladles—worm gear, trolley, sulky, teapot spout, reservoir, bottom pour, mixing and buggy ladles—dozens of different styles. Accessories manufactured by the company are shown also—such as ladle bowls, bails, shanks, tongs, etc. Good literature to have on file.

53. Muller Type Sand Mixers

Clearfield Machine Co. combines catalog No. 79 with bulletins C-2 and C-3 to show their line of sand mixers all the way from the small one fed by one man with a barrow up to the giants which have built-in stairs! Also, there is an article on "The Preparation of Foundry Sands" that is a worthwhile feature.

54. Materials Handling

Cleveland Crane & Engineering Co. presents very well prepared brochure on application data concerning the best use of hoists and cranes of all types for the most economical movement of materials throughout the plant. Well illustrated to show various materials being handled. Form No. 2008.

55. Blast Cleaning-Dust Control

Pangborn Corp. has for you their new bulletins No. 214 and No. 909-A on these vital subjects. Twenty and twenty-eight pages, respectively, in these booklets and a wealth of information on airless blast cleaning and industrial dust control. When studying your own problems this literature is a MUST to help you solve them!

56. Molding Machines

SPO Inc. has issued three booklets of line of Jolt Squeeze, Jolt Squeeze Strip machines; also on "Milwaukee" Jolt Squeeze Pin Strippers. Every foundry should have this nicely illustrated literature.

57. Fork Lift & Pallet Trucks

Towmotor Corp. has folder full of information on capacities, load centers, lift heights, weights, dimensions, speed of travel, etc. compiled and illustrated so busy executives can make up their minds fast on types needed. Also one on their model W electric pallet truck.

58. Foundry Oil & Gas Burners

Hauck Mfg. Co.—Catalog No. 1043 B shows oil and gas-burning equipment for cupola lighting, molding, drying, ladle heating, core baking, furnace heating, etc. Gives some specifications and illustrates many uses. Save fuel, save time, save money by having this information at hand.

59. Crucible Melters' Handbook

Crucible Manufacturers Association will send with their compliments this booklet chock-full of very valuable dope on the use and care of crucibles in various types of melting furnaces, metals, etc. Gives melting tables, alloying data and standard crucible sizes.

60. Testing Machines

National Forge & Ordnance Co. — Brochure No. 501 on their table model testing machines for tension, compression, flexure, shear and transverse. High precision, moderate cost —15,000 and 30,000-lb capacity. Highest reading cannot be jarred into error. Ask for this literature.

61. Power Wheelbarrow

Koehring Co. shows "Kwik-Mix Moto-Bug" power wheelbarrow doing various jobs around a plant. With a few of these "Moto-Bugs" buzzing around your place, one man moves about five or six times the material he did before! Bulletin KM280-1.

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies," "Trade Publications" or "Helpful Literature" in this issue—simply circle corresponding item numbers on one of these cards

6-51

FOUNDRY
Penton Building, Cleveland 13, Ohio

Please send literature or detailed information on subjects circled at left to—

NAME _____ TITLE _____

COMPANY _____

PRODUCTS MANUFACTURED _____

ADDRESS _____

CITY AND STATE _____

This card MUST be completely filled out. Please TYPE or PRINT.

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3	15	27	39	51	63	75	87	99	111
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5	17	29	41	53	65	77	89	101	113
6	18	30	42	54	66	78	90	102	114
7	19	31	43	55	67	79	91	103	115
8	20	32	44	56	68	80	92	104	116
9	21	33	45	57	69	81	93	105	117
10	22	34	46	58	70	82	94	106	118
11	23	35	47	59	71	83	95	107	119
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Cleveland 13, Ohio

Readers' Service Dept.

62. Core Oil

E. F. Houghton & Co. discuss "tailor-made core oil to meet today's needs" in a splendid four-page presentation. Tells about their 'service' through field representatives on core oils, lubricants, wetting agents, cleaners, coolants and packings. A lot of information packed into this one!

63. Airless Blast Cleaner

American Wheelabrator Co. offers catalog No. 74-B entitled "The Airless Wheelabrator—What it is and What it will do". Beautifully executed booklet, profusely illustrated and contains much information of value to all foundrymen who are faced with cleaning problems.

64. Fork Lift & Tiering Truck

Mobilift Corp. offers file size bulletin showing 117-in. lift with but 72-in. clearance. Specifications and photos show the "Tier-Master" taking care of a lot of different jobs.

65. Dust, Fume & Smoke Control

Claude B. Schneible Co.'s bulletin No. 450 with swell illustrations and accompanying blueprint layouts shows actual applications of Schneible equipment in foundries. Take care of dust, fumes and smoke at the source and you improve working conditions and save money!

66. Rejects Due To Porosity

Tincher Products Co.—Tells how to recover castings suffering from this very common ailment. Also have brochure on the "BlockBinder" for surface defects, repairing cracked parts, etc. Even if you don't have these troubles, send for this literature anyway!

67. Dumping Buckets

Penn Iron Works, Inc.—Literature on self-dumping and lever operated dump buckets. Lot of foundries we know could use several. Perhaps they are cheaper by the dozen! Use them for sand, pig iron, coke, scrap and many other materials that have to be moved.

68. Dust Collecting Systems

Kirk & Blum Mfg. Co. wants you to have 26-page spiral bound book entitled "Dust Collecting Systems in Metal Industries". This is a must for the files of all who cope with dust removal, ventilation, cooling, blower systems, etc. Get It!

69. Industrial Cranes

Thew Shovel Co.—20-page illustrated bulletin deals with applications of Lorain cranes to industrial materials handling operations. On-the-job pictures show how various types of materials are handled. Rubber-tired Moto-Cranes, self-propelled Lorain cranes and crawler-mounted models are described.

70. Colloidal Graphite

Acheson Colloids Corp. publishes bulletin No. 425 on "dag Colloidal Graphite" in the foundry. Used as a parting compound and as a coating for permanent molds, patterns, flask pins, shoulder screws, ladle interiors and chills. Brush it, dip it or spray it. Gives superior reproduction and smoother casting surfaces.

71. Saw Attachments

DeWalt Inc. — 12-page illustrated catalog 1-51 gives details of tools and attachments for use with DeWalt woodworking machines. Specifications are listed on circular saw blades, dado heads and cutters, cutter heads and blades, abrasive and cut-off wheels, drills and boring bits, disk sanders, table extensions, belt sander, lathes and jig saws.

72. Scaling Tools

Cleco Div., Reed Roller Bit Co. offers brochure on line of air tools for removal of weld spatter, cleaning sand, scaling, beading and peining. Various styles of chisels, star drills, etc., easily attached and changed from job to job.

73. Buckets and More Buckets

Blaw-Knox numbers their late bulletin No. 2232, and it is profusely illustrated with photos of actual use of their many types and styles of foundry buckets and ingot tongs. Single and two-line buckets, controllable discharge foundry buckets, dumping buckets, etc. Send for it!

74. Air & Hydraulic Cylinders

Miller Motor Co.'s new binder-full of bulletins on air cylinders, hydraulic low pressure cylinders, boosters, accumulators and safety air hoists comprises a complete lesson on the application and use of their line of equipment. Are you using available air pressure to lighten physical labor and more efficiently accomplish many operations?

75. Foundry Flasks

Black, Sivalls & Bryson has issued complete 100-page catalog and price list of their line of foundry flasks. All done in handy ring binder and indexed so that users can turn to the exact information desired. Very complete book and a good one to have in your reference files.

76. Portable Electric Grinders

Mall Tool Co. will send a dandy little booklet (Form No. 437) on flexible shaft grinders. Say they have larger catalog ready soon and will send that also soon as off the press.

IMPORTANT READING FOR FOUNDRYMEN
We have a limited quantity of the following reprint which we can furnish while they last.

77. Nonferrous Pyrometry

An interesting article reprinted from a recent issue of FOUNDRY discusses pouring temperature and its effects on various nonferrous castings. Also discusses various types of instruments for the control and measurement of temperatures throughout the casting operation.

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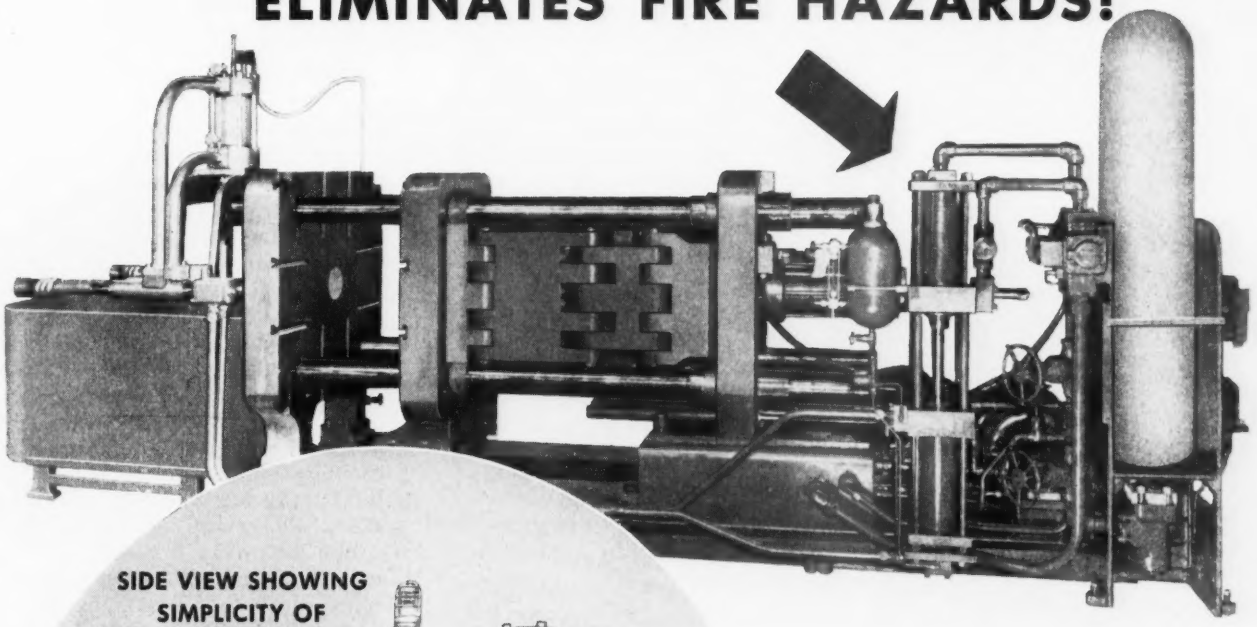
NOW! a new, improved CAST-MASTER DIE CASTING MACHINE

. . . with Hydraulic System that ELIMINATES FIRE HAZARDS!



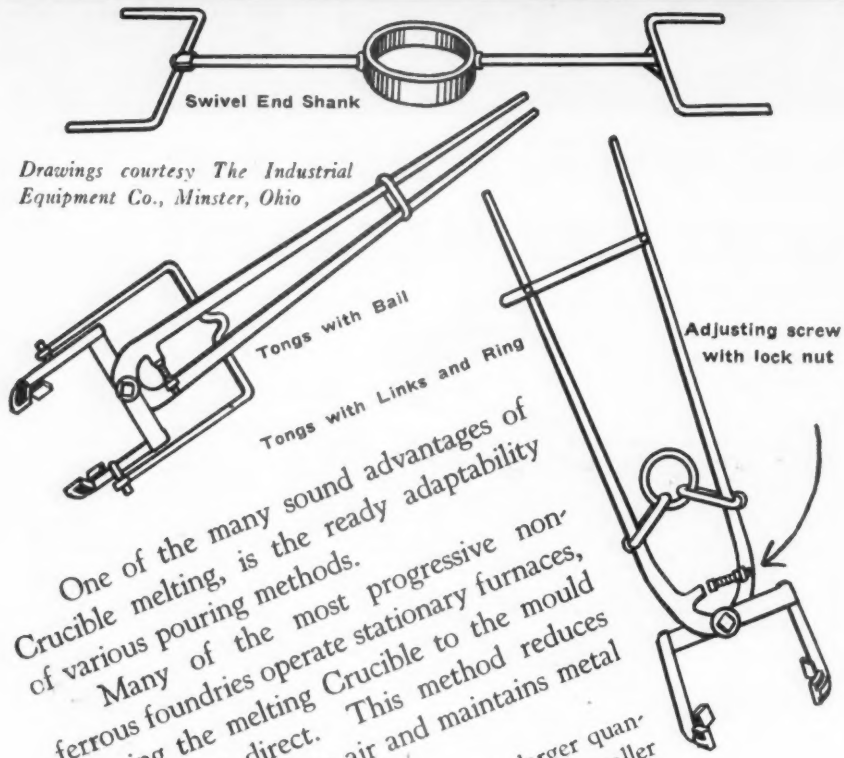
SIDE VIEW SHOWING SIMPLICITY OF OPERATING PANEL

Another Miller-Taylor achievement that makes the new CAST-MASTER die casting machines the safest in the industry. The new closed hydraulic system uses either soluble or a non-flamable oil instead of hydraulic oil to eliminate fire hazards on the shot end of the machine. Telescopic Fluid Transmission assemblies to hydraulic ejection die lock and shot cylinder eliminates all hose and flexible piping —thus offering an additional safety feature. For complete safety protection and maximum operating efficiency you'll find it hard to match the newly improved CAST-MASTER!

Write For Complete Specifications!

MILLER-TAYLOR TOOL CO. 5005 Euclid Ave., Cleveland 3, Ohio

CRUCIBLE TONGS and SHANKS



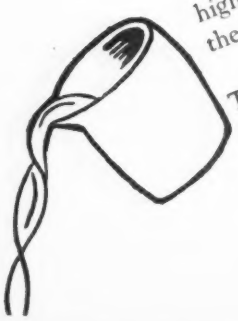
Drawings courtesy The Industrial Equipment Co., Minster, Ohio

One of the many sound advantages of Crucible melting, is the ready adaptability of various pouring methods.

Many of the most progressive non-ferrous foundries operate stationary furnaces, carrying the melting Crucible to the mould and pouring direct. This method reduces exposure of metal to air and maintains metal temperature.

Other foundries prefer to melt in larger quantities, and operate tilting furnaces using smaller Crucibles or ladle-liners for carrying and pouring. For either practice proper design of tongs and shanks is essential for efficient metal handling. Care of this equipment to maintain proper fit is highly desirable to get the maximum service from the Crucibles.

A satisfactory model of tongs is the Cradle Type Tongs (see illustration) adjustable to carrying various sizes of Crucibles without pinching. You save and profit by standardizing your entire foundry on Crucible melting because it is **Flexible, Reliable** and **Economical.** There is valuable Crucible information in Crucible Melters' Handbook; mailed free.



CRUCIBLE MANUFACTURERS ASSOCIATION

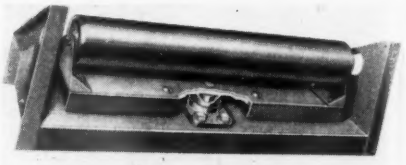
90 WEST STREET
NEW YORK 6, N.Y.

(*Continued from page* 246)

vices. Heating is accomplished by electric immersion heaters for 220 v operation or by a steam coil. Unit is equipped with positive action controls and safety devices.

For More Details Circle No. 14—Page 247

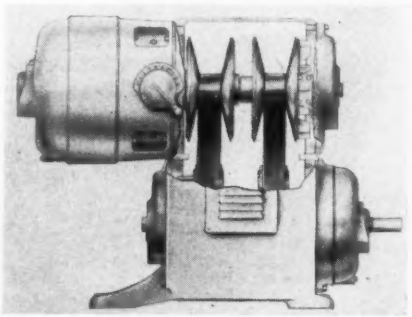
Self-aligning Idler: Chain Belt Co., Dept. PR, 1600 West Bruce St., Milwaukee 4—Self-aligning belt conveyor return idler is said to reduce the possibility of belt damage from roving because it provides auto-



matic alignment for the return run of the belt without the use of side guide rolls. It is mounted on a roller bearing turntable, with the entire assembly tilted 45 degrees in the direction of return belt travel. Lateral movement of the belt to one side moves that side of the roll forward and downward, decreasing belt pressure on that side. At the same time, the opposite side of the roll moves back and upward, increasing belt pressure on its side. Through this counterbalancing action, the belt automatically returns to its central position. Pulley can be supplied with 4, 5 or 6-in. diam steel rolls, and also with a 5½-in. diam rubber-covered spiral roll.

For More Details Circle No. 15—Page 247

Motors: U. S. Electrical Motors Inc., 200 East Slauson Ave., Los Angeles 54—Heavy-duty variable speed motors with ratings up to 50 hp have dual transmission belts. In carrying the heavy load through the internal



speed changing transmission, the dual belts distribute the load so that no undue strain is imposed. A special tension control has been incorporated to counterbalance belt load. A calibrated spring is employed to maintain pressure between the two halves of the driven variable disks and the sides of the belt. The spring takes up any slack that might be caused by

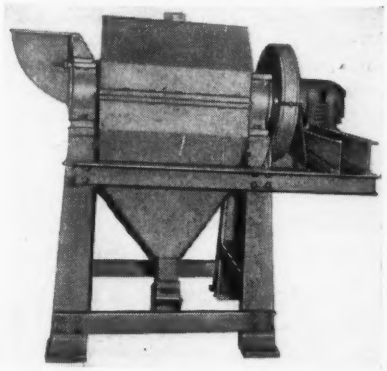
stretch or wear of the belts. Use of dual belts is said not to affect the ease of changing motor speeds which is accomplished by turning a dial.

For More Details Circle No. 16—Page 247

Metal Spray Gun: Metallizing Co. of America, 3520 West Carroll Ave., Chicago 24—Metal spraying gun is designed especially for coating shafts, rolls or machine element parts from a lathe mounting. In addition to rebuilding worn parts, it is claimed ideal for spraying corrosion-resistant metal coatings and for reclaiming mismachined castings and machine parts. Gun will spray No. 15 B & S gage wire up to 3/16-in. diam, from the lowest melting point metal to the highest. Speed is rated up to 18 lb per hr for aluminum and nickel, up to 80 lb per hr for zinc. Wire speed is adjustable to suit type of metal being sprayed. Gun uses an acetylene flame to melt the wire. Air is used to atomize and carry the metal to the surface being coated.

For More Details Circle No. 17—Page 247

Metal Separator: Peerless Metal Separator Co., 158 Greene St., New York 12—Dry process metal separator for use on all nonferrous

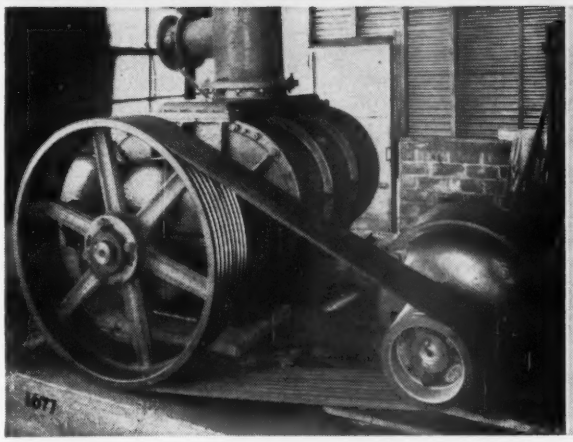


metals is designed to extract good metal from skimmings, slags, dross and sweepings. Its operation is said to be automatic and to require no heat, water, or skilled operator. It recovers 50 to 80 per cent of waste metal and makes it available for immediate resmelting.

For More Details Circle No. 18—Page 247

Floor Repair: Warren Refining & Chemical Co., 750 Prospect Ave., Cleveland 15—Asphalt, mastic floor surfacing material is intended for repair of concrete, wood, brick, steel or composition floors. Material is said to spread from a feather edge to any desired thickness and to form a tough, flexible, rubbery surface that will carry 12,000-lb loads on steel wheels or form a soft surface for easy walking. Additional claims are that it will not chip, crack, dust or splinter

Production depends on V-P-L



ROTARY

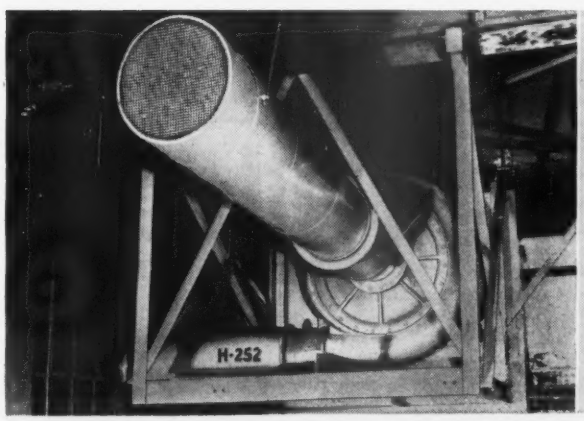
Motor-driven, Type RCS Blower for cupola service in southwestern foundry. Capacity 4,500 cfm.

Top performance of your cupola calls for a blower that can be depended upon to deliver positive Volume at required Pressure —and at Low power cost to keep down operating expense.

You'll be sure of V-P-L when you install R-C Centrifugal or Rotary Positive equipment. From this exclusive *dual-ability line*, you can match blowers to your plant's requirements. Then, with capacities from 5 cfm to 100,000 cfm, you can have the size which closely fits demands, with probable savings in time, cost, space, weight and power.

To keep production moving, use R-C Blowers and Gas Pumps with V-P-L. You'll be assured of the same fine, trouble-free performance which has been built into R-C equipment for almost a century.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Madison Avenue, Connersville, Indiana



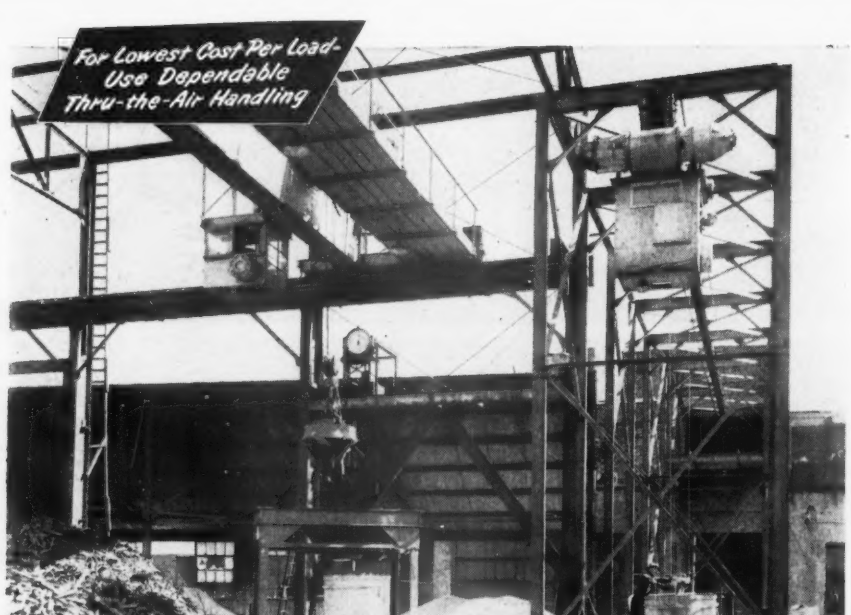
CENTRIFUGAL

Type OI Centrifugal Blower for cupola operation in large midwestern manufacturing plant. Capacity 6,300 cfm.

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES



Shepard Niles weather-proofed, double-monorail cupola charger, teams up with a 5-ton Shepard Niles weather-proofed, magnet-handling crane and Shepard Niles bottom-dump cupola buckets to speed operations and reduce handling costs at a large mid-western foundry. Notice that crane operator has unobstructed view of scale, assuring accurate control of proper amounts of pig and scrap iron.

we start by asking "what"

WHAT are *your* problems? Under WHAT conditions will *your* crane or monorail hoist be operated—intermittently, or under fairly constant conditions? WHAT are the operating speeds necessary to meet *your* productive cycle?

Answers to these and similar questions made it possible for Shepard Niles to provide efficient, dependable service, plus extremely low maintenance costs—giving this mid-western foundry the lowest handling cost per load for years to come.

Be sure you get the equipment best qualified to do *your* job. It's wise—and costs you nothing—to get the facts first, rather than to make expensive changes later.

May we place our experience of a great many years of successfully designing all types of crane installations at your disposal?

Shepard Niles

CRANE & HOIST CORPORATION

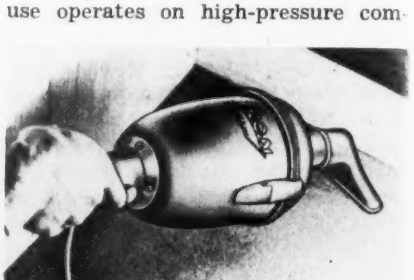
Makes and sells all three lifting tools for airborne shop loads

360 SCHUYLER AVENUE • MONTOUR FALLS, N. Y.

and is unaffected by cold or heat water, steam, sparks or most acids and is silent. It can be laid outdoors and is never slippery.

For More Details Circle No. 19—Page 247

Vacuum Cleaner: Syntron Co., 540 Lexington Ave., Homer City Pa.—Vacuum cleaner for industrial use operates on high-pressure com-



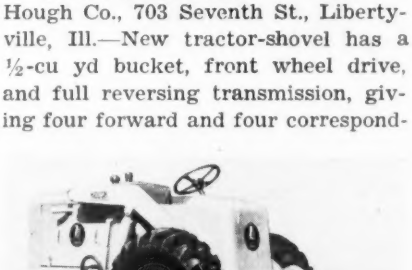
pressed air and is designed to clean stockbins and dusty or linty machines. It is particularly useful under explosive conditions where electric cleaners would present a hazard. Unit operates on air pressure of 70 to 160 psi and at 100 psi consumes about 4½ cu ft of air per minute. A 12-ft length of air hose is furnished.

For More Details Circle No. 20—Page 247

Paint: Wilbur & Williams Co., 130 Lincoln St., Boston 35, (Brighton) Mass.—Silicated rubber coat exterior finish, developed for painting stucco, cement, and masonry of all types, is said to bridge hairline cracks, acting as filler and finish coat combined. Intended as a one-coat application, the paint comes ready-mixed in white and can be tinted as desired.

For More Details Circle No. 21—Page 247

Tractor-Shovel: Frank G. Hough Co., 703 Seventh St., Libertyville, Ill.—New tractor-shovel has a ½-cu yd bucket, front wheel drive, and full reversing transmission, giving four forward and four correspond-



ing but faster reverse speeds. Forward-to-reverse motion is provided by a separate directional shift independent of the regular gear shift. Top speed forward is 14 mph and top reverse speed for carrying full loads is 23 mph. Rear wheel steering and compact, short wheelbase provide maneuverability and short turning

radius. Lifting, lowering, dumping, and closing of the bucket are accomplished hydraulically. Maximum dumping clearance is 7½ ft. Company's line now includes seven models ranging up to 1½ cu yd capacity.

For More Details Circle No. 22—Page 247

Junction Boxes: Stone Mfg. Co., 489 Henry St., Elizabeth 4, N. J. —Weatherproof, cast aluminum junction boxes have a variety of covers and fittings for universal use on almost any outdoor wiring or lighting job. Box has four hubs tapped ½-in. IPS, is provided with or without mounting lugs, has a flat aluminum cover plate sealed with a heavy cork gasket and a separate cast aluminum cover tapped ½-in. IPS to take standard lamp holders for the 150, 200 and 300-w weatherproof reflector bulbs.

For More Details Circle No. 23—Page 247

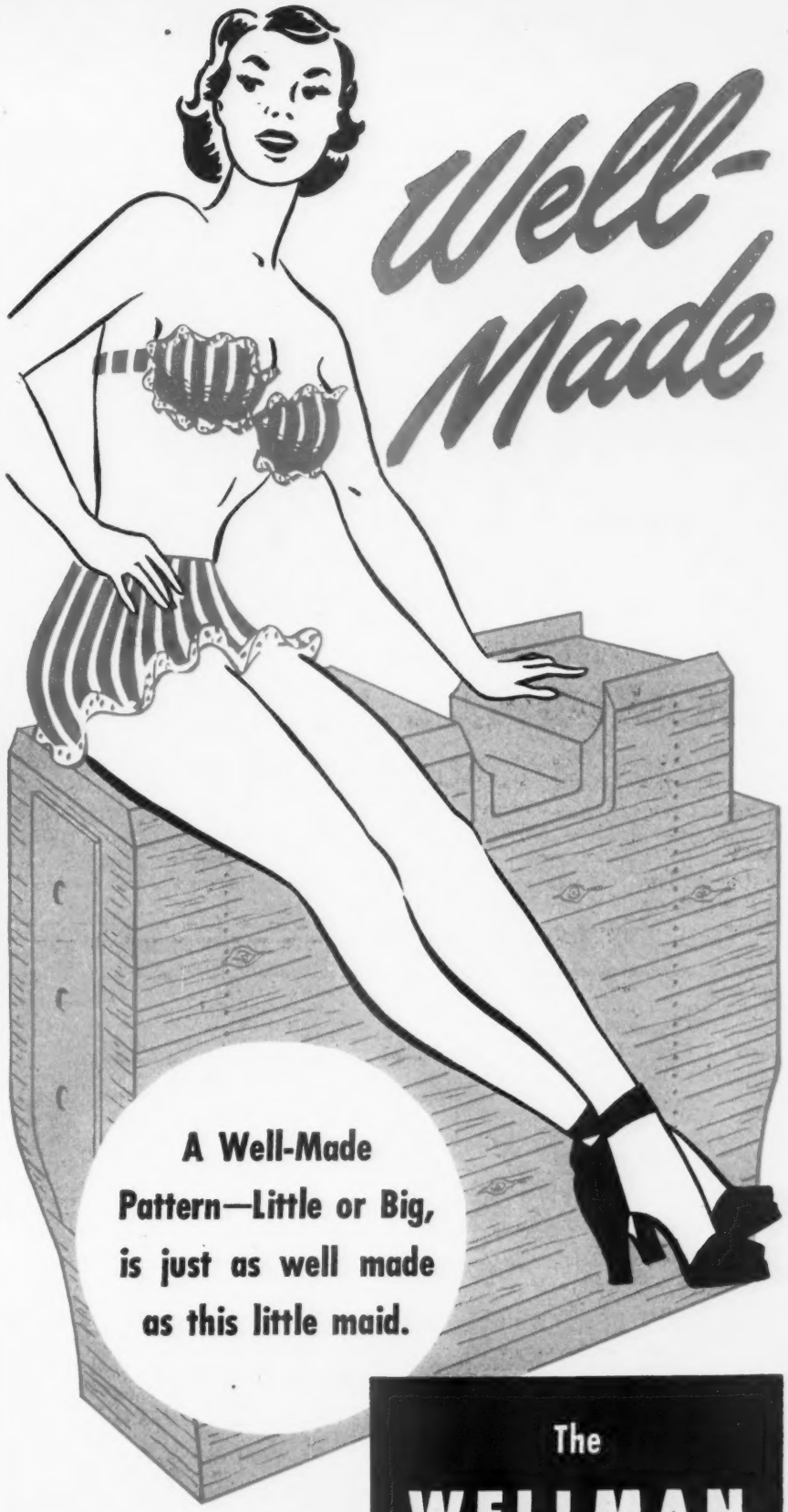
Magnet Chain: S. G. Taylor Chain Co., Box 509, Hammond, Ind.— Magnet chain employs a special locating plate in the ring to keep the

three suspension legs at 120-degree centers where they cannot gang up on the ring. Friction, twisting and gouging are said to be eliminated, and level lifts and even distribution of load weight assured. Chain assembly is made from heat-treated alloy steel, and it is claimed that a 1¼-in. diam, three-leg chain assembly on a 65-in. magnet will lift up to 110,000 lb. Company has acquired exclusive manufacturing rights on this chain from the Downtown Co., Cleveland.

For More Details Circle No. 24—Page 247

Lens Tissue: American Optical Co., Southbridge, Mass. — Silicone-treated lens tissue is designed for use in keeping safety goggles clear, clean and polished. Tissue removes foreign matter and deposits an invisible coating of silicone on the lenses, making each wiping last longer and the next cleaning easier and faster. For convenience of users a 20-gage steel dispenser with mounting screws included is offered. It allows removal of one 5 x 6¾-in. tissue at a time.

For More Details Circle No. 25—Page 247



Drop us a note on your business letterhead and we'll be glad to put you on our list for the Wellman magazine.

The WELLMAN Bronze & Aluminum Co.

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I DETECT HE BONDS
HIS MOLDS WITH---

CONSISTENTLY HIGH QUALITY

NATIONAL BENTONITE

It doesn't take a detective to find out that National Bentonite helps foundrymen make better molds. A great many expert foundrymen have used National Bentonite regularly for years to insure molds with high strength both green and hot, with minimum moisture content. This last point is important, since it means much less chance of gas holes and blows. Molds made with National Bentonite also yield castings with finer finish—and that's often important, too.

These APPROVED DISTRIBUTORS are ready to supply you.

American Cyanamid Co.
New York, New York

The Asbury Graphite Mills, Inc.
Asbury, New Jersey

Barada & Page, Inc.
Kansas City, Missouri (main office)
Also—(Branches)
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Oklahoma City, Okla.
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Dallas, Texas
Houston, Texas
New Orleans, La.

G. W. Bryant Core Sands, Inc.
McConnellsville, New York

Lloyd H. Canfield Foundry Supplies
Kansas City, Kans.

Combined Supply and Equipment Company
Buffalo 7, N. Y.

The Foundries Materials Co.
Coldwater, Mich.—Detroit, Mich.

Foundry Service Company
North Birmingham, Alabama

James R. Hewitt
Houston, Texas

Interstate Supply & Equipment Co.
Milwaukee 4, Wis.

Independent Foundry Supply Co.
Los Angeles, Calif.

Industrial Supply Co.
San Francisco, California

Klein-Farris Co., Inc.
Boston, Massachusetts
New York—Hartford, Conn.

La Grand Industrial Supply Co.
Portland, Oregon

La Salle Builders Supply, Ltd.
Montreal, Quebec, Canada

Marthens Company
Moline, Illinois

Carl F. Miller & Co.
Seattle, Washington

Pennsylvania Foundry Supply & Sand Co.
Philadelphia, Pennsylvania

Refractory Products Co.
Evanston, Illinois

Robbins & Bohr
Chattanooga, Tennessee

Smith-Sharpe Company
Minneapolis, Minnesota

Steelman Sales Co.
Chicago, Illinois

Stroller Chemical Co.
Akron, Ohio

Wehenn Abrasive Co.
Chicago, Illinois

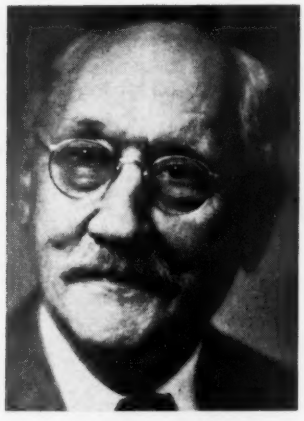
Mr. Walter A. Zeis
Webster Groves, Missouri

BAROID
SALES DIVISION
NATIONAL LEAD COMPANY

BENTONITE SALES OFFICE
RAILWAY EXCHANGE BLDG.
CHICAGO 4 • ILLINOIS

OBITUARY

DR. HEINRICH RIES, chairman of the Sand Division, American Foundrymen's Society and former head of the geology department Cornell University, died Apr. 11. Dr. Ries, a native of Brooklyn, N. Y., received M. A. and Ph. D. degrees from Columbia School of Mines. He was one of the first to direct scientific attention to foundry sand and was one of the original members of the AFS foundry sand research committee. Dr. Ries was made an honorary life



DR. HEINRICH RIES

member of AFS in 1923 and in 1936 was awarded its Joseph S. Seaman Medal in recognition of his outstanding services to the foundry industry and the field of foundry sand research and control.

* * *

William K. Norris, 75, co-founder and until 1945 president, McQuay-Norris Mfg. Co., St. Louis, died there May 3. Mr. Norris organized the company in 1910 with Louis E. McQuay, to produce a piston ring developed by Mr. McQuay. Mr. McQuay retired in 1922 and Mr. Norris was chairman of the board until he retired last year.

* * *

Edward M. Handley, 76, retired superintendent of foundries, Chain Belt Co., Milwaukee, died Apr. 13. Mr. Handley, a native of Horicon, Wis., went to Milwaukee in 1912 following graduation from University of Wisconsin. During 37 years with Chain Belt he was molder, chemist, foreman and superintendent.

* * *

Stanley W. Brinson, 60, master molder at Norfolk Naval Shipyard, Portsmouth, Va., died Mar. 20 at his Norfolk, Va., home. Mr. Brinson entered the Navy Yard in 1906 as an electrician, resigning in 1909 to attend Virginia Polytechnic Institute, from which he was graduated in 1913.

He was appointed assistant shop superintendent in 1916 and in 1930 became master molder. He was made an honorary member of the American Foundrymen's Society in 1943 in recognition of his contribution to progress of the foundry industry.

* * *

John A. Murphy, 71, until his retirement in 1949 production manager, Allyne-Ryan Foundry Co., Cleveland, died there Apr. 16. Mr. Murphy was timekeeper at the old Interstate Foundry when the late Daniel J. Ryan left that company to found Allyne-Ryan and asked Mr. Murphy to join him.

* * *

Joseph A. Kalina, 86, for 58 years associated with Eberhard Mfg. Co., Cleveland, as a patternmaker until his retirement in 1941, died May 9. A native of Bohemia, he joined Eberhard Mfg. Co. a year after coming to this country.

* * *

S. Duncan Black, 67, president, Black & Decker Mfg. Co., Towson, Md., died Apr. 15 in Baltimore. Mr. Black was co-founder 40 years ago with Alonzo G. Decker of the company, which manufactures portable electric tools.

* * *

Harold Goodwin, 63, foundry superintendent, the Medart Co., St. Louis, died there Apr. 20. Mr. Goodwin had been associated with the steel products manufacturing company for 40 years.

* * *

Peter Weber, 77, for 40 years associated with Buckeye Brass & Mfg. Co., Cleveland, died May 8. Mr. Weber was a foreman at the time of his retirement 5 years ago.

* * *

William A. McKnight, 60, retired president-general manager, William F. Jobbins & Co., Aurora, Ill., producers of nonferrous ingots, died Apr. 14.

* * *

Edward O. Warner, 80, for many years Philadelphia representative, National Malleable & Steel Casting Co., Cleveland, died Apr. 8.

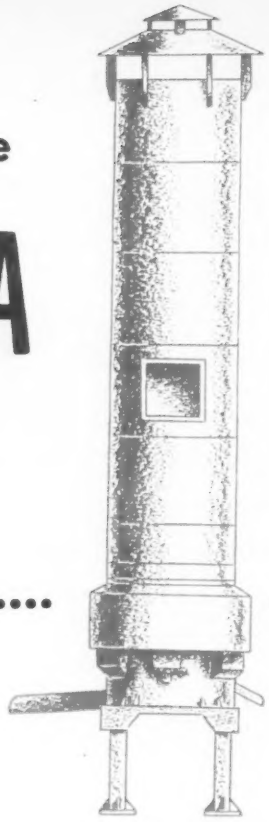
Issues Personnel Booklets

American Management Association, 330 West 42nd St., New York 18, has issued two new booklets in the personnel series, each priced at $1.25. "Critical Factors in Management Planning" contains a section on A-bomb protection in industry, and "Manpower Resources for the Emergency" contains a section on national mobilization policy.

93 Annual Rings....
EACH REPRESENTS A YEAR OF EXPERIENCE WITH THE LUMBER NEEDS OF FOUNDRIES AND PATTERN SHOPS
• You CAN'T fool around with indifferent lumber in a pattern shop or a foundry. We have studied the lumber requirements for foundries and pattern shops for almost a century, this knowledge and experience is NOT for sale: we pass it on to our customers as part of our service.
COMPLETE STOCKS on hand include genuine Northern White Pine, California Sugar Pine, Norway Pine, Honduras Mahogany, all kiln dried, Super thickness, rough or dressed.
DELIVERIES ANYWHERE. No matter where you are located, we can ship you as little as 100 feet or as much as a carload of excellent flask or pattern lumber. Address inquiry Dept. F.
RIETZ
LUMBER CO.
1810 N. CENTRAL PARK AVE.
CHICAGO 47, ILLINOIS

How to use the CUPOLA

By BERNARD P. MULCAHY
President
Fuel Research Laboratory Inc.
Indianapolis



This sixth of a series of articles describes types of cupola fuels and materials used to supplement carbon absorption

ALTHOUGH we generally consider coke as the fuel used in the cupola, the high production rates of all foundries in recent years has forced the industry to supplement this main fuel with other materials.

The fuels now used consist of by-product coke, beehive coke and anthracite coal. In addition, other materials have been used, not as a fuel but to supplement carbon absorption in the process, due to a deficiency in the regular coke used or a reduction in the pig iron content of the charge. Such materials are pitch coke, petroleum coke, calcined pitch coke, carbon electrodes and graphite blocks. A brief review of these materials follows:

By-product Coke—Coal itself is a highly complex organic substance, and the selection of particular grades for foundry coke is necessarily very involved. Not only must the moisture, sulphur and ash contents be carefully limited, but also the coking characteristics themselves must fall within narrow boundaries. Carbonizing conditions must be carefully regulated at all times and require a stringency of control not encountered for other grades of coke.

Coal, as mined, is not in the state of preparation for immediate charging to the ovens. This is true for two reasons: (1) its size, generally, is not sufficiently small or uniform enough, so it is crushed and pulverized at the coke plant, (2) few coals by themselves produce cokes of sufficient strength and character to meet present day requirements. Blending of two, three or four different coals is now practiced universally to obtain the desired structure.

After the coals have been selected, they must be pulverized and blended in the proper proportions, and charged into the airtight ovens. The ovens are long chambers, roughly 40-ft long, 10½-ft high, and 17¼-in. wide (some variation from these dimensions occurs at different plants), holding approximately 12½ tons of coal. The ovens operate in batteries for purposes of heat distribution. Each oven has its individual control for refinement.

The usual pulverizing process consists of preliminary crushing, reducing the coal to approximately 1½ in. and smaller and simultaneously removing any tramp iron. This is then placed into the mixing bins from which it is fed to the mixing belts immediately ahead of the pulverizer. Here the coal is pulverized so that approximately 90-95 per cent passes through an 8-mesh screen. This pulverization and mixing accomplishes uniform mixing and distribution of the various constituents of each coal and also of the different kinds of coal. This, of course, results in a more uniform charge to the oven and, therefore, a more uniform coke.

Until recent years, the practice of blending coals was carried out by volume mixing, that is, the per cent of volatile coal was mixed with a certain per cent of low volatile coal, both percentages on a volume basis. The coke from blended coals was better generally than coke produced from a straight, high-volatile coal, but volume mixing presumed too much and variations in coke structure still continued. This was due to the fact that the weight proportions were not the same as the volume proportions because of size of coal and moisture content influence. The correction of this variable factor was to weigh the coal in the proportions desired.

Again calling attention to the fact that each coal and coal mix has individual coking characteristics, the proper coking time must be selected and maintained to produce the desired physical and chemical structure of the coke. Temperatures are so adjusted, after this feature has been determined, that the ovens push on a predetermined time and in series, which schedule is carefully adhered to so as to minimize structural changes in the coke.

Coal is charged directly into the hot oven through holes in the top of the ovens. Carbonization begins immediately, commensurate with the existing wall temperatures. The progressive changes of the coal are as follows: (1) moisture is driven off, (2) the coal softens and fuses, (3) gas is released, causing frothing, and (4) the mass hardens, leaving the porous or cellular structure associated with coke.

Regulate Coking Time

The ovens are heated from both sides as uniformaly as possible and the heating plane advances from both side walls toward the center of the oven. This results in parallel planes, first of coke at both walls, then two thin plastic layers, and between these a common layer of coal. The rate of heat progression toward the center is a direct function of the coking time or wall temperature.

The coke is pushed from the ovens directly into a receiving car and taken to a quenching station where a regulated quantity of water is sprayed on it to cool it immediately and prevent burning. After quenching, it is dumped on the wharf for feeding to the screening system.

Beehive Coke—This coke is made from coal and takes its name from the shape of ovens originally employed. The gas liberated from the coal is burned within the oven, and the heat reflected back to the top of the

charge continues the carbonization downward through the pile. This results in the long, spindly pieces characteristic of this coke. Very little blending of different coals is employed in this process and as usually practiced, only high-volatile coals are used. Such coals normally shrink considerably during carbonization and the fissure development is in consequence very extensive. This is reflected in the narrower, spindly pieces produced and the generally brittle character of this coke. The longer coking time employed, however, partially offsets this shrinkage tendency. Frequently it is silvery gray in color with a slick, knobby surface of pure graphitic character.

These ovens will hold from 4 to 7½ tons of coal per charge at a depth of 18 to 24 in., with a coking time of 40 to 72 hours. The ovens are flat and wide with a relatively small coal charge.

Anthracite Coal—Although this material was widely used years ago, it was discontinued with the advent of coke. Shortage of coke in recent years has made it necessary in certain instances to supplement the coke supply by the use of some anthracite coal.

This material is different from coke in its physical properties and its combustion characteristics, with the result that its action in the cupola can alter the process. Metal temperatures and melting rates are lower with anthracite and carbon absorption is less. For this reason its use must be carefully controlled.

When it is necessary to use a portion of anthracite coal as a cupola fuel it is suggested that it be uniformly mixed with the coke (coke charge). It is not advocated to use the coal in the original bed.

Reason for the above suggestion is to disturb the bed practice as little as possible; mixing the coal with the coke in the charge will distribute its influence and upset combustion in a minimum manner.

Pitch Coke—This generally refers to the coke produced from carbonizing tar. It is a very pure carbon material, of low ash and sulphur content. It is used in small amounts—as a carbon raiser generally 15 to 20 lb per ton of iron charge. The size of this material is quite erratic and varied unless screened and prepared for special purposes. It is not available in large quantities, so that generally its use is confined to plants close to the source of production.

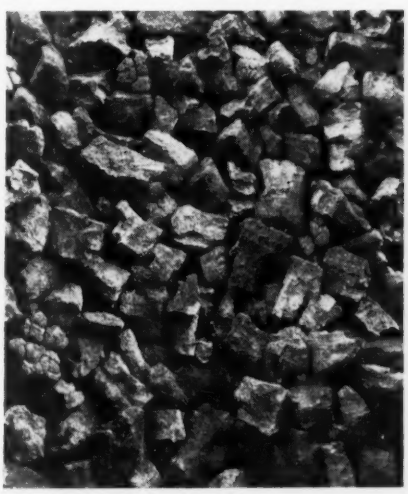
Petroleum Coke—In most instances this material is of indeterminate size, ranging from extremely fine pieces to very large lumps. It is also quite oily and burns rapidly. Its sulphur content also is erratic.

Calcined Pitch Coke—This material has been produced at high temperatures and results in a very hard, dense product of excellent physical properties. In certain instances it can be obtained as a sized product. In the writer's experience this has been the most effective carbon raiser encountered, because its combustion properties are regular due to both its native chemical and physical properties.

Carbon Electrodes—Sometimes this material has been used when sufficient quantities of spent electrodes have been available. It has not been too effective in raising carbons.

Graphite Blocks — This is pure graphite in briquetted block form, and is regularly available. It has been used in counteracting low pig iron charges.

(To be continued next month)



Sized by-product coke (left) and beehive coke (right). The spindly size characteristic of the latter results from the use of high-volatile coals which normally shrink considerably during the process of carbonization

Rapid Growth Marks Texas Malleable Foundry

(Continued from page 113)

large and small castings are arranged in the pots to make most efficient use of the available space and at the same time to prevent warping of the parts during the subsequent annealing. Loaded pots are moved by the trolley to a conveyor located beneath a gravel bin. Gravel is introduced around the castings and the loaded pot then is handled by crane for stacking. Joints between adjacent pots are mudded and the stacks placed in an oven by lift trucks for annealing.

Nine periodic ovens and one car type oven are employed. Currently a 75 x 80-ft addition is being made to the annealing room to provide space for three new pot type, periodic, 30-ton capacity annealing ovens.

A simple but rapid and effective method empties the pots after the annealing cycle and separates castings from packing material. A lift truck removes the stacks of pots from the ovens, and after cooling they are hauled to the shakeout station shown in Fig. 7. Individual pots are picked off by a bail attached to an electric hoist and swung over the shakeout grid. Just before reaching the shakeout the top of the pot is engaged by two hooks which tilt the pot and dump the contents onto the shakeout. Gravel drops through the screen for collection and reuse while the castings are vibrated off onto an apron conveyor. Operators stationed along the conveyor pick off the castings and sort them into wagons for transfer to the cleaning room.

Throughout the operations of chipping, cleaning, grinding and final inspection, castings are handled so that they are at waist level and require no excessive stooping or lifting by the workers. Cleaning operations are accommodated by three airless blast barrels and two tumbling barrels, and castings are ground at nine double-stand grinders and one swing grinder station. Two hydraulic presses for straightening work complete the major equipment in the finishing department.

From the grinding and inspection area castings are transferred to the adjoining shipping room and dock. In common with many industries of the state Texas Foundries makes extensive use of motor trucks in making deliveries to customers. Most castings are delivered in this manner. One of the company's fleet of eight trucks, a tank truck, doubles as a carrier of

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both castings and oil; it makes a round trip daily to one of the refinery centers, delivering castings and returning with a load of fuel oil for the foundry's use.

The foundry in general is laid out for an efficient flow of raw materials and components into finished castings. Good ventilation and illumination and emphasis on safety measures combine to provide desirable working conditions. The plant (Fig. 8) includes a main foundry building, 175 x 390 ft, from one end of which extends the coremaking and core storage department. The annealing department projects from the other end. A 45-ft-wide craneway leads from the raw material yard to the mechanical cupola charger and melting department located about midway the length of the main building.

Separate buildings house the general office, pattern shop and storage, central stores, sand and brick storage, laboratories, bath house, and the canteen. The canteen, actually much larger than its name implies, provides excellent facilities for workers' meals and assembly meetings.

Duplex Melting Employed

The foundry employs the duplexing process. Melting facilities include a cupola lined to 72-in. diameter and an air furnace having a capacity of 16¼ tons per hour. Another melting unit is a 36-in. cupola used for experimental and production runs of nodular iron. The company is a licensee of the International Nickel Co. for production of Ductile iron.

A small aluminum foundry adjoins the pattern shop. It is devoted to the production of core driers, coreboxes and pattern castings. Most of the cores used are made by machine, the coreroom having nine blowers capable of producing cores ranging from 2 to 60 pounds.

The molding department in the main foundry building is arranged to accommodate both the variation in size of castings produced and the fact that 20 to 30 pattern changes are made on the molding machines daily. Molding facilities comprise five separate units. The largest, part of which is shown in Figs. 1 and 3, consists of 13 jolt-squeezers and two pairs of cope and drag machines. Molds are made in pop-off flasks, set out on roller conveyor lines extending from each station, and are fitted with aluminum jackets and weights before pouring.

Each of two other molding units is equipped with a rollover machine from which the drags are kicked out to a roller conveyor, and a pin-lift

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cope machine. Another unit has a similar drag making machine and two pin-lift machines. The two largest machines, for cope and drags, were mentioned previously (Fig. 2) and constitute another unit. The fifth unit, also a cope and drag setup, comprises six machines, and is shown in Fig. 5.

Two new mechanized molding units currently are being added. One will be a cope and drag setup with two pin lift machines designed to handle molds up to 48 in. long. These will accommodate light castings having thin sections, such as levers, frames, etc. The other unit will also be a cope and drag setup for heavy-duty, chunky type castings, such as trailer and truck hubs, wheels, brake shoes, etc. This unit will be equipped with three molding stations to handle three-part flasks, and will include jolt-squeeze machines for the drag and cheek and a pin lift machine for the cope.

All molding units receive sand from overhead hoppers supplied by a central preparation unit. Sand mixing and distribution facilities are located on a platform above the foundry floor, as shown in the left background of Fig. 3. Regular checks are made of molding sand properties in a well equipped laboratory.

A separate laboratory also is conducted for physical testing and control work connected with daily production, while another laboratory department, known as the specialties division, is devoted to testing and developing new products involving the use of castings. Considerable importance is attached by the company to its laboratories for their part both in maintaining the quality of product necessary to retain existing markets, and in promoting broader uses for castings.

New Trade Group Formed

Refractories Institute, a new trade association, has been formed by members of the refractories industry. Purpose of the institute is to promote demand for the products of the industry, spur additional research with the objective of still further improving products and processes, and cooperating with government agencies in the interest of the public and the industry.

Approximately 40 corporations, representing the major portion of the industry, have joined the new association. First officers of the group are James L. Crawford, Walsh Refractories Corp., St. Louis, president, and W. A. Turner, McLain Fire Brick Co., Pittsburgh, treasurer.

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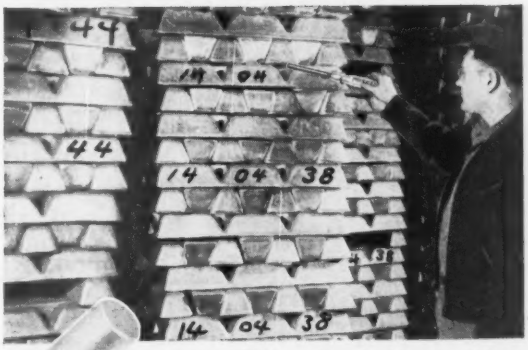

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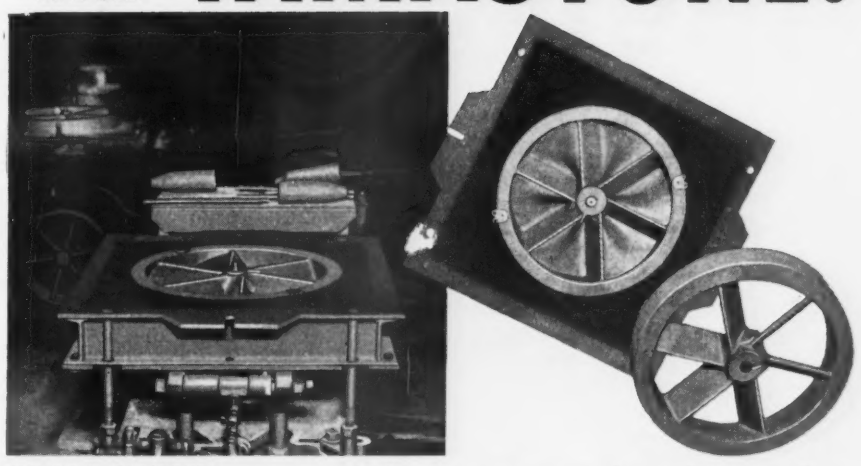

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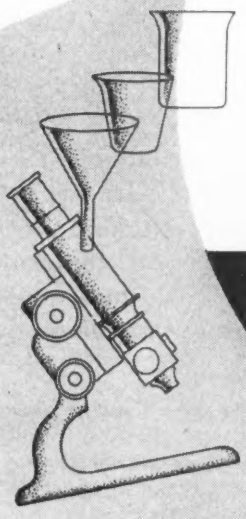

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Coreboxes and Driers

(*Continued from page* 117)

of the corebox is usually mounted on the blow plate on this machine, and the core is drawn from the upper half of the box on the down stroke of the clamp piston.

Side clamps are not standard on this type machine, and are only used in special applications.

This machine has an automatic control valve which will put the machine through its complete cycle by moving the starter handle downward. After the cycle is completed, the starter handle returns to the up position ready for the next cycle.

Clamping pressures on both the diaphragm type and the draw type machines range from a minimum of 7500 pounds on the smaller machine to 55,000 pounds on the larger machines. Such pressures applied on the corebox must be considered when designing the building corebox equipment.

Shows Composite Core

Fig. 4 illustrates a core that is not from any particular casting but which is a composite core showing various conditions that are typical of many types of cores that might be considered for core blowing.

This core has a large center section with bosses having ribs forming pockets in the main body. There are two round extensions to the right and a projection to the left of two diameters. On the upper surface are two small conical core prints.

In studying this core, we find that a practical parting would be as outlined through the center of the core. To blow this core, there are two practical surfaces from which to work, either the lower face or the upper face. The upper face was selected to blow into because it is the shallower and the more practical side on which to place the drier on which this core is to be baked.

Examination of this core indicates that the best places to locate blowing holes are where the sand will readily flow into the various pockets in the main body of the core so that when the sand enters the corebox through these blow holes, the box will be filled from the lowest level upward until completely filled. A blowing hole was located in the round projection to the left outside the metal line indicated by the dotted line in order to assure proper packing at this point. The projections or barrels to the right could be blown by vertical blow holes in the print end, but due to the extreme length of this blow hole, it was decided that it would be preferable to blow as shown. By directing

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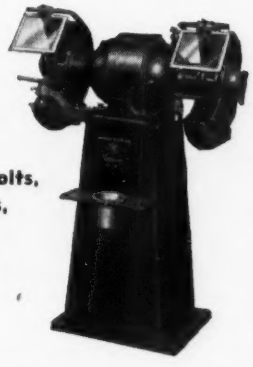

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a stream of sand into the barrel through a blow elbow as indicated, the corebox wear at this point will be greatly lessened.

The projection at the left with the curved surface at the bottom lends itself nicely to blowing, but the abrasive action of the sand would be quite destructive. It would be best to omit a blow hole at this point, because blowing directly on this curved surface creates a point that wears rapidly and is extremely hard to repair. Instead, a large vent was placed over this opening and, as the corebox is filled, the sand will direct itself upward toward this vent, packing the print and the upper pocket solidly. The other conical print at the top of the core is located over the main body of the core, and the sand directed through this blow hole strikes a flat surface at the bottom and far enough away from the blow hole that the wear at this point should not be excessive.

Release Vents on Top

As previously stated, most of the air release vents are in the top surface of the corebox. The only ones that I have indicated in this particular core in the bottom of the corebox are those around the boss in the center main body of the core. Others would be added only if experiment proves they are required. It should be kept in mind that there should be no interference between blow holes and vents; all vents should lead to atmosphere and be so arranged with relation to the blowing holes that air and sand entering the box will not interfere with escape of trapped air.

After further study, we find that it would require an 8½ x 21 inch inside opening of the sand reservoir to blow this core properly. This is indicated on the sketch, which also shows the two different types of vents that are placed in the blow plate rather than in the corebox. To the left is the large vent over the one core print leading to atmosphere and to the right is the blow hole through a blow bushing that has a vent area around the outside to allow air to escape to atmosphere. This is shown in the enlarged view above.

Before building a corebox, information should be at hand as to whether the requirements are for a few or many cores from a given box. If this core were a short run job that is run occasionally, there is a possibility that it could be blown in a well constructed wood corebox. In the present discussion, however, we are assuming that the production requirements are sufficiently high to justify careful consideration of those factors

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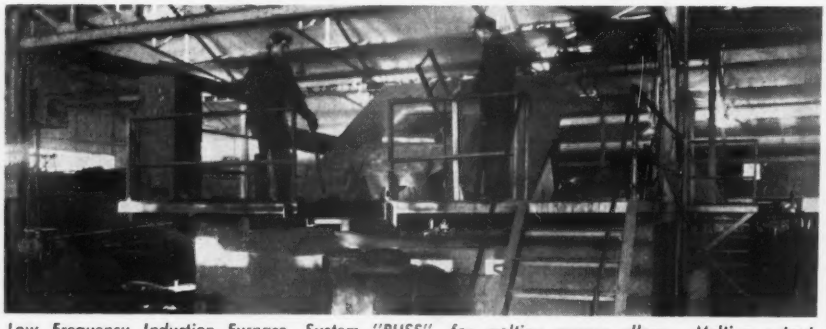

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which will result in maximum life, efficient operation, and low maintenance. Our discussion of design, therefore, is based on a corebox made of either magnesium or aluminum.

In the design of this corebox (Fig. 5), we considered its weight, strength and rigidity, and have made provisions to minimize wear as well as simplify maintenance. Note that the top and joint are steel faced. The top and bottom surfaces should be parallel to permit clamping without the possibility of sand leakage during blowing. The bottom slide rails and the guide rail to one side are steel faced, and the center rails are spread out to give good support to the corebox joint so that under the clamping pressure, this joint is tightly held. The joint flange should be well supported with ribs.

The top of the box is steel faced with two types of steel facing to minimize wear and reduce maintenance. At the center of the corebox, it covers the entire surface of the main body due to the fact there are a number of blow holes in it and it is more economical to use this type of steel face rather than a series of washers such as are shown at the ends.

Describes Blow Hole Bushings

Bosses are provided at those points where blowing holes are to be located. In a production corebox, these holes should be bushed, the usual practice being to make the bushings of thin wall seamless tubing. The tubing can be peened over the steel facing, making a tight seal at this point. The plate should be securely fastened to the top of the corebox with flat head screws. The round washers at each end should also be secured with small screws and the blow bushings should be peened around the opening at the blow hole.

At the right-hand end, a cast-iron elbow insert is provided to take the wear from the blow stream. These parts are held in place by two screws and provision should be made so that they can be replaced when they become worn.

At the opposite end, a different condition is shown. Here we have placed an insert directly below the blow hole and this insert should be made so that it can be replaced. The inserts are usually made of cast iron or synthetic substances now available that have great resistance to abrasion.

Handles should be provided at each end on both halves of the box.

The corebox pin lugs are spaced well apart and are in line and on one side of the box. This is good design in that it permits accuracy and con-

venience in locating the top half of the box on the lower half and also simplifies the operation of placing the drier over the core box pins in proper position to be dropped down over the top of the core. In general, the flanges are well reinforced and the bottom ribbing does not necessarily have to conform to the top ribbing of the box since in the layout of the top ribbing, the location of the blow holes was taken into consideration. In laying out the ribbing for the lower half of the box, the desire for widely spaced guide rails determined their location.

In the design of a core drier (Fig. 7) the aim should be rigidity and lightness. Wherever possible, excess metal should be removed. While it is common practice to use annealed aluminum castings for driers, we may have to revert, under present conditions, to cast-iron driers on account of controls on the use of aluminum. So this would make it more important that any excess metal be eliminated.

Reduce Drier Weight

This drier is laid out showing the main flange of the drier relieved from the corebox joint approximately 1/16-inch with suitable filing pads for fitting at certain locations. Ribs run lengthwise and crosswise, giving rigidity to the drier itself. The ribs or rails that run lengthwise are spaced out widely as these ribs are used to slide the core and drier onto a rack in the core oven. To get lightness as well as proper heat circulation about the core, we have indicated perforations in the main body of the drier and windows going around the two core prints at the center section, and windows on the two barrels and the two diameter projection at the opposite end of the core. In other words, the drier is designed so that only the surfaces of the core that have to be supported are supported, using as little metal as possible to maintain rigidity.

To elaborate on what is meant by cutting windows in the core drier, refer to Section AA. On many driers the drier is fitted to a point approximately 45 degrees each side of the center line, and then a relief is made running from nothing at 45 degrees to about 1/16-inch at the parting. The metal following this contour was left in the drier. If we have this relief for clearance, then why is it necessary to have metal there at all? This metal can be taken out when the drier is designed and as a drier has to be handled many times during the day, lightness is important.

By the same reasoning, we supported the core prints in the upper view to the right by placing a fitted

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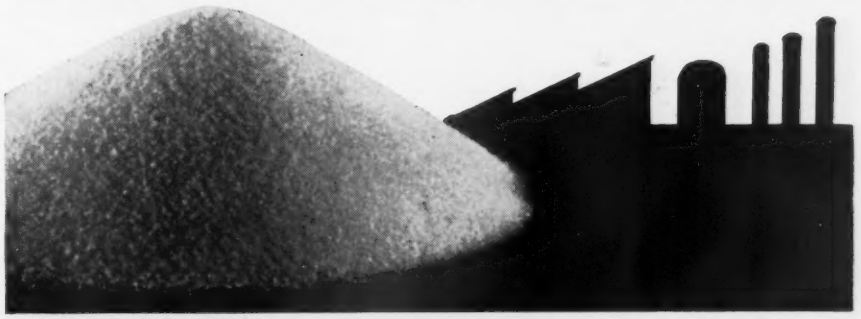

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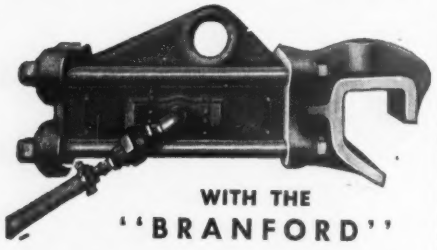

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pad on the bottom only with the sides relieved entirely. The same condition exists on the projection at the left end of the core. We have supported only the bottom of the large diameter and with this diameter properly supported, the small diameter of this projection would not have to be supported at all. In general, both the design and construction of core driers is as important as the design and construction of the core box itself. Fig. 6 shows a typical example of a drier in which weight has been reduced to a minimum without sacrificing core support.

What we have done here is to take a typical core as an example, and we have analyzed it to determine the method of making it on a core blowing machine. We have designed a light-weight corebox with strength and rigidity to stand high production use. We have incorporated in its design steel facing, steel blow tubes, and replaceable inserts to simplify maintenance.

We have tried to show by proper design that much maintenance can be eliminated and, when wear does occur, the maintenance can be taken care of and the box put in proper shape with the least expense.

We have then designed a drier for this core, pointing out the importance of lightness and rigidity and have shown where metal can be eliminated to reduce the weight of such driers by using perforations and windows to eliminate unnecessary metal.

There has been, and perhaps always will be, a never ending change of shapes and designs in castings, presenting new problems for the foundry. It would be impossible here to cover every type of core but we hope that some of the features we have pointed out will build better coreboxes for use with the core blowing machine.

Editor's Note: This paper was presented before the fourth annual Ohio Regional Foundry Conference in Cleveland, Mar. 9.

Book Review

ASTM Standards on Industrial Water, paper, 168 pages, 6 x 9 inches, published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $2.

This second edition, prepared by ASTM Committee D-19 on Industrial Water, brings together in convenient form the various ASTM standards, tentative methods of sampling, analysis and testing of industrial water. It includes 31 methods which cover sampling, analysis, corrosivity tests, methods of reporting and general testing methods. Also, specifications for substitute ocean water and standard definitions of terms relating to industrial water are included.

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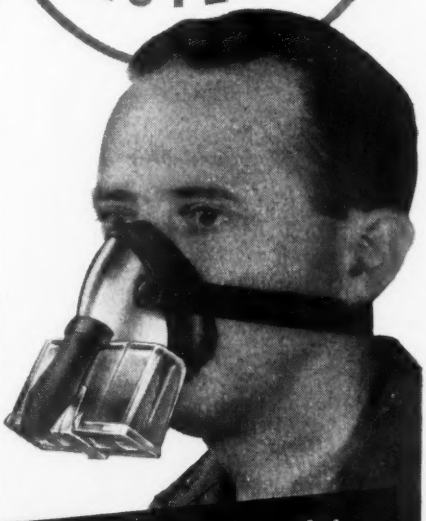

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Open Hearth Conference Has Large Attendance

Attendance at the 34th annual conference of the National Open Hearth Committee, American Institute of Mining and Metallurgical Engineers, held at Hotel Statler, Cleveland, Apr. 2-4, was almost a record with 1050 present. Opening day was devoted to an inspection trip of various departments of Republic Steel Corp.

At the first technical session on open-hearth operation, under the chairmanship of R. W. Devine, Erie Forge Co., Erie, Pa., and F. C. T. Daniels, Mackintosh - Hemphill Co., Pittsburgh, H. P. Rassbach, Electro Metallurgical Co., Chicago, pointed out the metallurgical advantages of the acid open-hearth process. He indicated that steel produced by the process is exceptionally clean and free from tendency to flake.

Reasons suggested for these properties included low oxygen level before deoxidation, ability to control temperature, boil and carbon content, and absence of hydrogen absorption by the steel.

In discussing "Types of Charges and Their Effect on Production Rate" J. B. Kopec, Acid Open Hearth Research Association, Pittsburgh, presented data on 20 selected heats showing variations in time from tap to charge, charge to melt, and melt to tap. In tap to charge the time varied from 1 hr 36 min to 2 hr 12 min; in charge to melt from 4 hr 42 min to 6 hr 8 min; from melt to tap from 2 hr 29 min to 3hr 2 min, and in tap to tap the time varied from 8 hr 52 min to 11 hr. Best results were obtained with pig and heavy scrap mix while the poorest were obtained with additions of considerable rusty light scrap and turnings with the pig and heavy scrap.

At another session, with R. C. Solomon Jr., Granite Steel Co., Granite City, Ill., and Clyde B. Jenni, General Steel Castings Corp., Eddystone, Pa., presiding, linings for cupolas, use of high iron ore charges, refractories for furnaces and scrap preparation were discussed. P. R. Sultzbach, Stanley Works, Bridgeport, Conn., stated that his firm uses cupolas melting 10 to 12 tons per hr to supply hot metal to the open hearths. Lining in the melting zone is silica brick backed with fireclay block. They operate 72 to 80 hr, and the burnout is 18 to 24 in. at the end of that period.

J. Willis, Central Iron & Steel Co., Harrisburg, Pa., said that his firm now is experimenting with cupolas lined with a siliceous mix applied by an air gun, similar to practice employed in a number of foundries. The cupolas are operated only 24 hr, the

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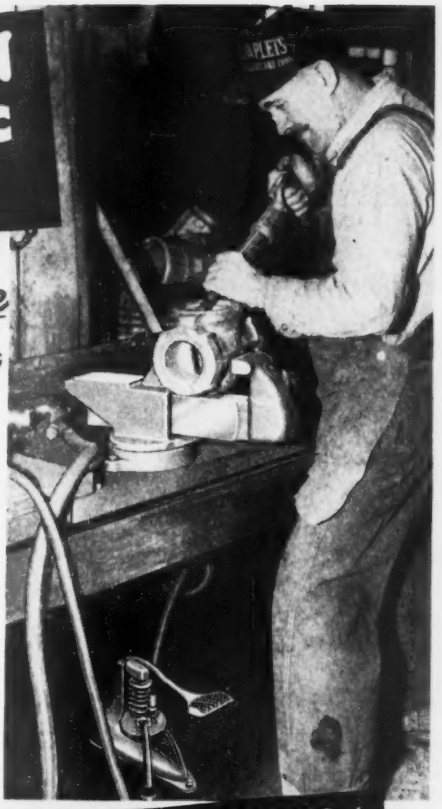

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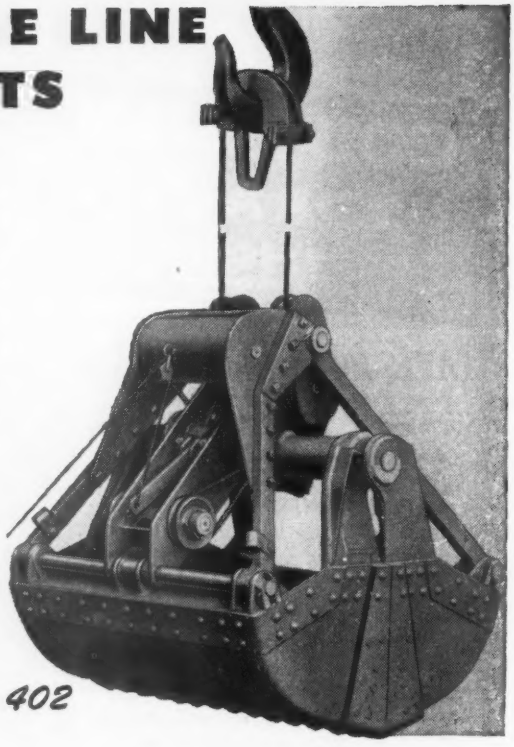

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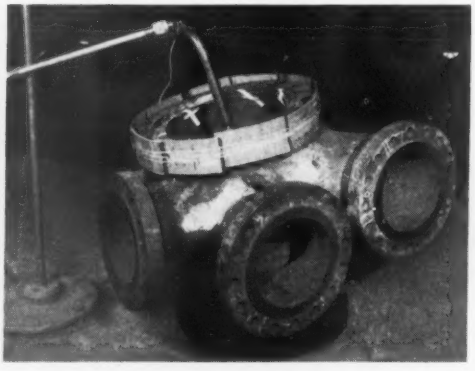
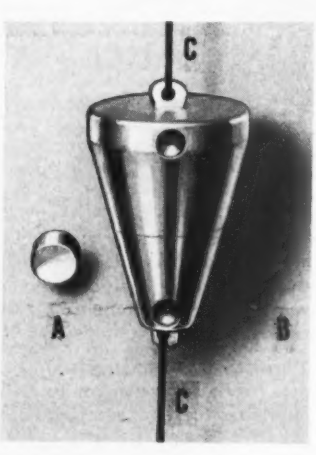


Radiographing a flange on a heavy steel casting.



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bottom dropped, and the cupola relined. Advantages are 4 per cent increase in amount of hot metal delivered to open hearths, reduction in cost of maintenance and materials, and elimination of water cooling of cupola shell. Disadvantages include necessity of making up the cupola bed each time and increase in number of cupolas.

H. M. Parker, Armco Steel Corp., Butler, Pa., in discussing use of high ore charges to reduce the amount of tramp elements in the final steel, said that substitution of 12,000 lb of ore for a like amount of iron scrap provided a 2 per cent reduction in favor of the ore. This in the case of steels which had to be low in such elements as copper and tin.

Refractories and their performance in cold metal shops were described by Paul Akin, Laclede Steel Co., Alton, Ill. H. C. Paxson, Lukens Steel Co., Coatesville, Pa., and Charles Kay, American Steel & Wire Co., Worcester, Mass. J. L. Jennings, General Steel Castings Corp., Granite City, Ill., described runners lined with brick and covered with magnesite rammed into place which gave good results. Nozzles for ladles were ground to shape and rammed into place with a mixture of red loam and clay. Good service was obtained.

Wilt H. Steinheider, Sheffield Steel Corp., Kansas City, Mo., described procedures employed in handling scrap so that charging buggies could be loaded to maximum density. Some material is sheared and others cut to size with a torch. Light scrap is segregated and bundled.

Chicago's Oldest Steel Foundry Plans Additions

Chicago Steel Foundry Co., claimed to be the oldest steel foundry in Chicago, is planning plant improvements. Starting in 1906 as an iron foundry with six crucible steel furnaces, the company subsequently substituted side blow converters, which, in turn, were abandoned and electric furnaces installed in 1920. The company specializes in alloy steel castings and various grades of heat and corrosion resisting alloys.

Company facilities have been enlarged repeatedly and now occupy approximately 7 acres of land 8 miles from the Loop at 3720 South Kedzie Ave. Recently placed contracts for a more complete mechanization of the plant include a new and modern furnace of larger capacity, conveying equipment and other machinery amounting to about $150,000. Installation of the new equipment is expected to be completed by fall.

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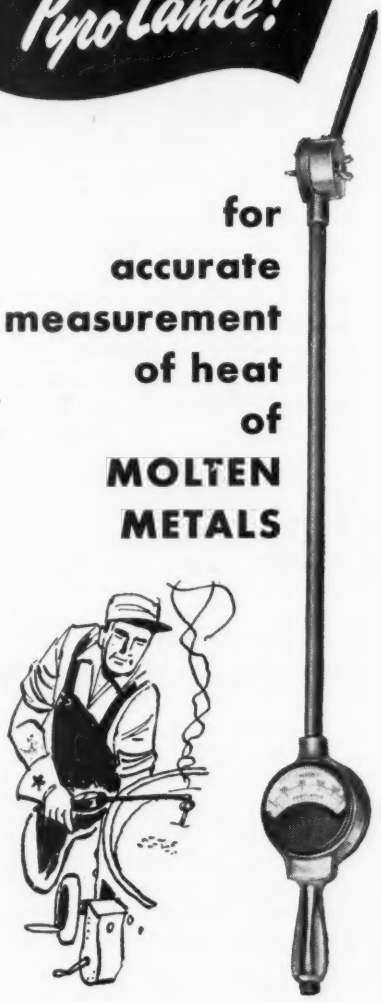

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Wrong With Castings?

(*Continued from page* 108)

part to half that of the invisible crack-like defect. Even though the visible defect occupies 10 per cent of the cross-sectional area of the section, the part with the large defect is loaded at a lower level. One wonders how many parts have been put into service containing cracks, or crack-like defects, that could not be seen under ordinary inspection but which actually increased the loading by 200 per cent. One also wonders how many service failures that seemed to be mysteries were due to these undetected defects.

All discontinuities in a stressed part, whether inherent in the metal, or imposed on the part by design or fabrication, increase the stress level in a manner similar to that illustrated in Fig. 2. The only difference is one of degree. Regardless of the depth or position of the defect, the sharper it is the more dangerous it is.

Invisible Cracks Are Dangerous

This point should be of extreme interest to the foundryman if he is tired of being slapped around and wants to start fighting back. Crack-like defects that are almost invisible to unaided visual inspection are typical in wrought metals. These defects are much more dangerous in service than porosity or other rounded visible defects, typical in castings, that have been used by our competitors in their sales campaigns against castings.

However, there is a catch to all this. The foundryman must welcome magnetic and fluorescent particle inspection as allies, not consider these inspection procedures as enemies. True, these inspection procedures that show up invisible crack-like defects will cause some trouble to the foundry at first. However, they will cause more trouble to our competitors than to us. Why? Simply because some of the rounded defects that have damned castings are present as invisible crack-like defects in wrought shapes after they have been mashed flat in forging and rolling. Then too, laps, a crack-like type of defect, are formed in improper forging and rolling. Even though almost invisible, these crack-like defects show up under particle inspection.

The word "improper" in referring to forging and rolling must be emphasized. Don't misunderstand, there are plenty of wrought shapes being produced that are not defective. There are also plenty of cast shapes that fall in the same category. We are talking defectives. Practically all

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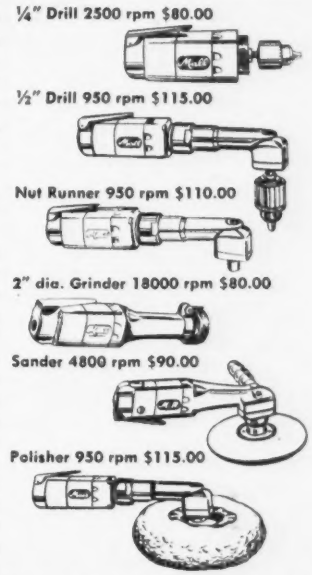

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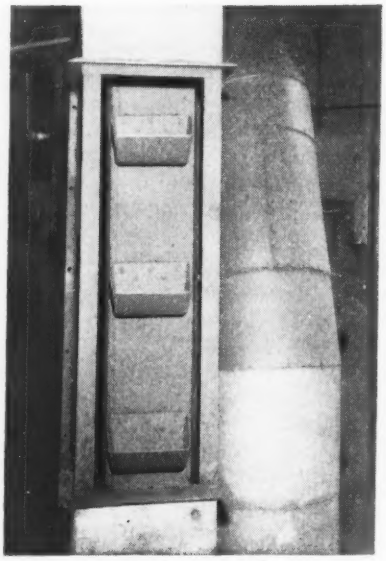

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wrought defects are crack-like defects, whereas only a few cast defects are of this shape. Seams, laps, burst, pipe, shatter cracks and flakes can be overcome in wrought products. The catch is that, just as in the foundry, overcoming them many times means money. All quality, in the last analysis, is based on economics.

For example, forgings are encroaching at present on a preserve of castings, short orders, where in the past castings have been used because of the initial die cost. This new competition is based on cheap forging dies. Forgings from these dies may look perfect, whereas they may be full of laps. Multiple pass dies would overcome this trouble, but they are expensive—often so expensive that economics would force the consumer back to castings. The only way the foundry can compete in these instances is on a basis of particle testing, and the foundry must be willing to accept these tests for castings.

In Mystery Class

If the foundry accepts particle testing and makes an earnest effort to eliminate those few causes of cracks inherent in castings, the nose rubbing will be reversed. Cracking and hot tearing has always been a mystery, but the foundry industry is itself at fault in making it a mystery. There have been too many opinions, not enough experimental work, too much jumping at conclusions, too much over-simplification. Is there any reason to assume that there is only one kind of hot tearing in the foundry? Until that is proved one must presume that there are many. Imagine the confusion that must result if one person is talking about one type of hot tear or crack and another is talking about another type.

Therefore, the first step in slapping back, rather than being slapped, is some semblance of order in the names and words used when discussing hot tearing and cracking. The first important point that must be made is a distinction between hot tearing and cracking. The terms now are being used carelessly. Both terms denote a crack-like defect but they should denote two distinct types of separation. Even though the difference is only in the temperature at which the separation occurs, this difference is important. Permit the writer to advance the following definitions, if for no other reason than that of an explorer:

Hot Tear—A separation from any cause occurring during solidification, or immediately below the solidus temperature.

Crack—A separation from any

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cause occurring at a temperature appreciably below the solidus temperature.

These definitions may seem too theoretical, but they are quite practical. They sharply define two types of crack-like defects. The ragged, discontinuous hot tear type forms due to stress during or just after solidification of the casting. There are undoubtedly many subtypes and causes of hot tearing. Crack denotes a separation that looks just like the cracks in a watermelon when it is dropped—not ragged and discontinuous, but sharp and continuous to the ends of the crack.

There is a very good reason for the difference in appearance, and the difference is important in diagnosis. The ragged hot tear denotes separation of the relatively coarse as-cast grains. The discontinuous appearance denotes the hetrogeniety of the metal at this temperature. The low melting constituents that are still relatively weak separate, while the higher melting point constituents that are solid at the temperature of separation and that have some ductility, deform with stress and do not separate. The sharp continuous crack denotes separation of a relatively fine grain metal (steel, for example, after the austenite-ferrite transformation) at a temperature where the physical properties of the individual grains are more uniform.

Heat Treatment Not Responsible

These definitions are particularly important when castings are heat treated after casting. Heating and cooling will open up, or make visible by scaling, many hot tears that were in the casting before heat treatment, but were invisible. Many, many times heat treatment has been blamed as the cause of "cracking" when the cause and cure of the defects was in the molding and casting operations.

This misconception is exactly the same as the confusion that existed not too many years ago regarding pinhole porosity. Frequently this porosity was blamed on annealing or heat treatment simply because scaling during heat treatment uncovered the pinholes. It took many years for pinholes to be recognized as a melting defect. This is a beautiful example of jumping at conclusions. Usually when the foundry jumps at a conclusion, the conclusion is wrong. Many years' headaches and many defective castings can be saved if a distinction is made each time between hot tearing occurring in the mold and cracking occurring during heat treatment, grinding, shakeout, or just plain rough handling.

The important rule to remember

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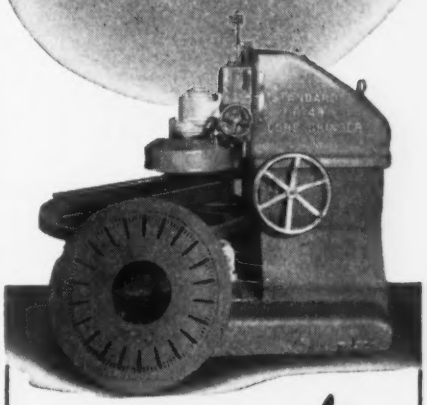

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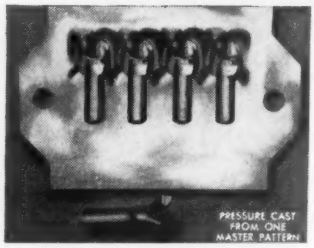

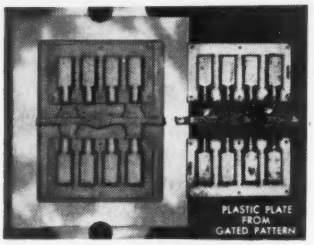

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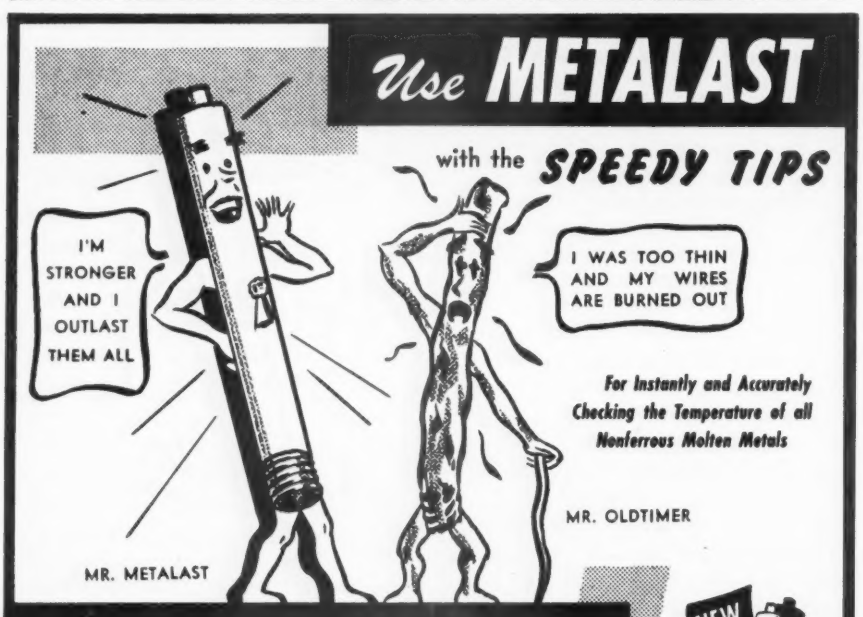

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is that a discontinuous, ragged separation denotes separation during, or just after, solidification. A sharp, relatively smooth crack denotes separation after the casting is solid, or at room temperature. Discoloration of the fracture helps in diagnosis in some cases, but cannot be relied upon.

Cracking during heat treatment, or from any cause after the metal is solid, is a metallurgical problem and the solution not too difficult, if the foundry will listen to the metallurgist and not jump to conclusions. Hot tearing is a foundry problem, and here too, there is too much confusion and too much unsupported opinion. Can it be that here again hot tearing is due to a number of causes and that the confusion that now exists is mostly due to lack of appreciation of this point?

Different Types of Tears

Every foundryman, at least all steel foundrymen, have observed a number of different types of hot tears —wide open ones that are easily visible, too visible; bore "cracks" tiny corner "cracks," "cracks" at junctions of sections, "cracks" with ridges around them, edge "cracks." Is there any reason to believe that all these separations are due to one factor such as the metal, the sand or gating? It seems more logical that each separation has occurred at a different temperature and under different conditions, even though the differences are slight. Perhaps we should coin a name for each or, if a name is not easily forthcoming, a number. Until that time a step forward will be a description of the hot tear or crack before discussion.

For example, wide open hot tears *seem* for the most part to be due to contractive stresses exceeding the tensile strength of the metal just below the solidification range. An approach to their elimination is a more collapsible sand, gating to eliminate hot spots, bracketing and, as a last resort, change in design. This type of hot tear is generally understood and methods to eliminate the defect are also generally understood. However, as the size of the hot tear decreases, confusion seems to increase.

The importance of shrinkage that causes wide open hot tears—not that occurring just after solidification—but during solidification—is not generally appreciated. Everyone who has examined just a few radiographs is familiar with the feathery appearance of some types of internal shrinkage. These feathers can, under certain conditions, extend to the surface and cause what seems to be hot tears. This

type of hot tear cannot be eliminated by making the mold and cores more collapsible. The only method of elimination is to feed or chill the area. Imagine the difficulties arising in a discussion if this type of hot tearing is confused with a contraction type.

Then there is some evidence that metal analysis and melting practice have some bearing on certain types of hot tearing. We therefore have at least four interrelated variables influencing hot tearing, and undoubtedly there are many more.

How can anyone hope for a common understanding, or even a start in solving hot tearing problems, until a start is made on words, until we start talking about hot tearing, not in general terms, but hot tearing under specific conditions? It is equally important to think of hot tearing as due, not to one single pet hate, but to a number of causes, many times acting simultaneously. If this is done, many of the mysteries of this problem will clear up. As a goal, the foundryman should always remember that crack-like defects are not nearly the trouble to him that they are to his competitors.

Particle testing will be an aid in this study. Even though such testing will show up some crack-like defects that are not known of until the test is used, the assurance that no more are being missed is an asset that will offset all liabilities.

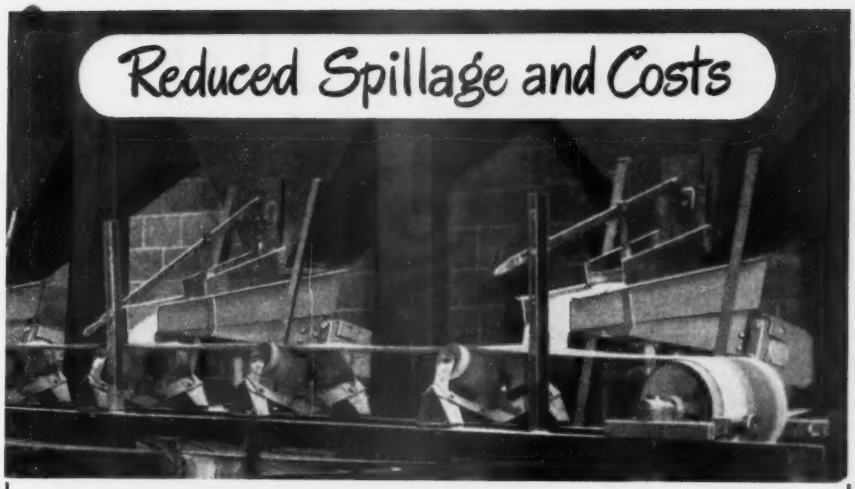
Purdue Offers Course In Quality Control

An advanced course in quality control by statistical methods is being offered by Purdue University, West Lafayette, Ind., June 15-23. Registration will be in room 202, Biology Annex, at 8 a.m. June 15, with classes beginning at 9 a.m. Classes will be held during the balance of the session from 8 a.m. to 5 p.m.

Tuition is $100, and attendance is limited to 50 persons. A special follow-up meeting will be held in the fall of 1951 for roundtable discussion of applications and interchange of ideas as part of the regular course. Room reservations may be made at the Union Club on the campus or at Fowler Hotel, Lafayette.

Folder on Malleable Iron

Malleable Founders' Society, 1800 Union Commerce Bldg., Cleveland 14, has issued a folder outlining the scope of the malleable iron industry, describing characteristics of malleable iron castings, and illustrating typical cast products.



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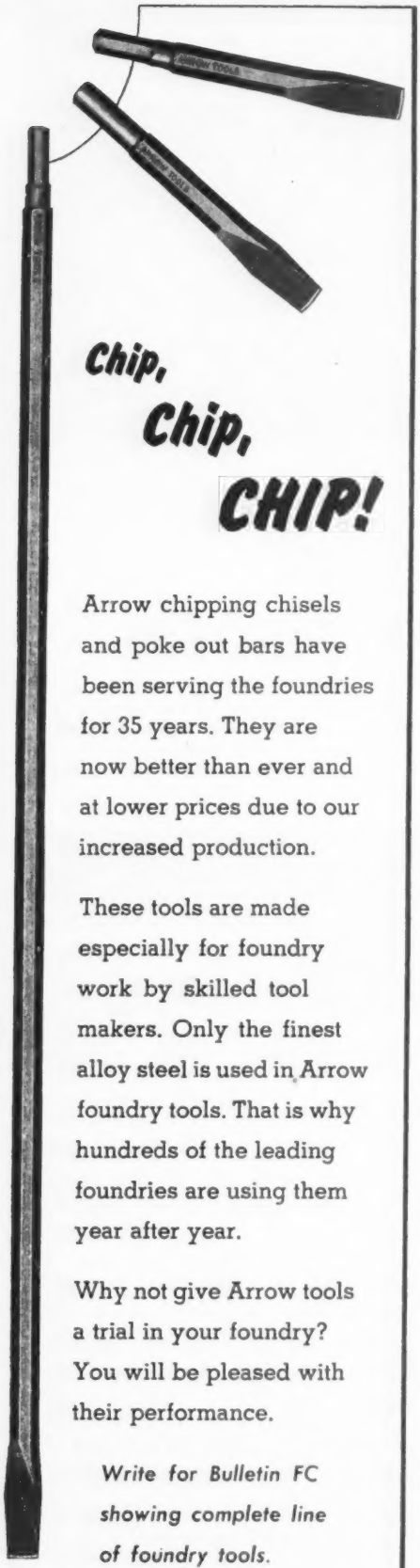

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...TRADE PUBLICATIONS...

For More Details on these Items Use Reply Card—Page 247

BLAST CLEANING: American Wheelabrator & Equipment Corp., 505 South Byrkit St., Mishawaka 2, Ind.—Catalog 724 shows application of specially designed airless blast equipment to 39 production cleaning problems in almost every major industry in the metals and metalworking field. Some production figures are given in specific cases.

For More Details Circle No. 90—Page 247

WHEEL MOUNTING: Grinding Wheel Institute, P.O. Box 64, Greendale, Mass.—Booklet discusses the proper mounting technique for grinding wheels on sleeve type mounts and contains recommendations covering the amount of torque or "wrench pull" to use when mounting grinding wheels on several makes of cylindrical grinding machines.

For More Details Circle No. 91—Page 247

RECORDERS: Leeds & Northrup Co., 4917 Stenton Ave., Philadelphia 44—Folder ND46-20(2) on load cell recorders covers suggested applications of an all-electric method for measuring and recording continuously thrust, pull, torque, weight, fluid pressure—stress and loads of all types. Automatic batch mixing of molding sand is described.

For More Details Circle No. 92—Page 247

BLOCKS, SHEAVES: American Hoist & Derrick Co., St. Paul 1—Catalog 300-24, describing company's line of blocks and sheaves, contains information on block number, capacity in tons, number of sheaves, rope size, and weight of each block. A ratio table and formula facilitate figuring line parts and reeving.

For More Details Circle No. 93—Page 247

WET WATER: Aquadyne Corp., 220 East 42nd St., New York 17—Folder on wet water and its possibilities for industry covers current industrial applications of wet water and a system of making an economic supply available without elaborate equipment.

For More Details Circle No. 94—Page 247

FORK TRUCK: Baker Industrial Truck Division, Baker-Raulang Co., 1250 West 80th St., Cleveland 2—Bulletin 1325, dealing with a 6000-lb capacity fork truck, contains dimension drawings, specifications and illustrated applications.

For More Details Circle No. 95—Page 247

OXY-ACETYLENE: Linder Air Products Co., 30 East 42nd St., New York 17 — Booklet, "Oxy-Acetylene Flames and Metalworking—A story of Industrial Progress," traces the history of the oxy-acetylene flame and explains how industry is using it in cutting, welding, and heating operations. Many specialized jobs of the flame, such as hard-facing, flame-softening, flame-hardening, powder-cutting and steel-conditioning are described briefly.

For More Details Circle No. 96—Page 247

TRACTOR-SHOVEL: Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Ill.—Catalog describes an improved 12 cu ft tractor-shovel with several application photos showing some of the jobs and industries where this machine is in use.

For More Details Circle No. 97—Page 247

FLOOR REPAIR: Stonhard Co., Dept. TF, 1306 Spring Garden St., Philadelphia 23—Folder describes a floor patching material which is said to overcome problems of excessive water conditions, oils, greases and acids.

For More Details Circle No. 98—Page 247

ACCOUNTING MACHINES: Management Controls Division, Remington Rand Inc., 315 Fourth Ave., New York 10—Three new folders, AB-446,447 and 525, describe simplified machine accounting procedures for payroll work.

For More Details Circle No. 99—Page 247

REFRACTORY: Ironton Fire Brick Co., Ironton, O.—Bulletin 100 describes a modern plastic refractory for monolithic boiler settings and industrial furnace linings. Cross-sectional drawings show typical applications.

For More Details Circle No. 100—Page 247

BANDSAW ACCESSORIES: Carter Products Co., 43 Mt. Vernon Ave., N.W., Grand Rapids, Mich.—Literature covers bandsaw machine accessories, including precision guides, quick-change tires, rigid wheels, and a guide line light.

For More Details Circle No. 101—Page 247

FIRE BRICK: Johns-Manville, 22 East 40th St., New York 16—Folder describes an insulating fire brick designed for sustained use at 3000°F. Tables give physical and thermal characteristics.

For More Details Circle No. 102—Page 247

LUBRICANT: Climax Molybdenum Co., 500 Fifth Ave., New York—Booklet contains excerpts from technical papers on the subject of molybdenum disulfide as a lubricant and antifretting material.

For More Details Circle No. 103—Page 247

LIFT TRUCKS: Buda Co., Harvey, Ill.—Bulletins 1536 and 1537 describe two new 2000-lb capacity fork lift trucks, one with a 15-in. and the other with 24-in. load center.

For More Details Circle No. 104—Page 247

SAFETY VALVE: Ross Operating Valve Co., 120 East Golden Gate Ave., Detroit 3—Bulletin 304 includes a cross-sectional view and installation data of a new air safety valve.

For More Details Circle No. 105—Page 247

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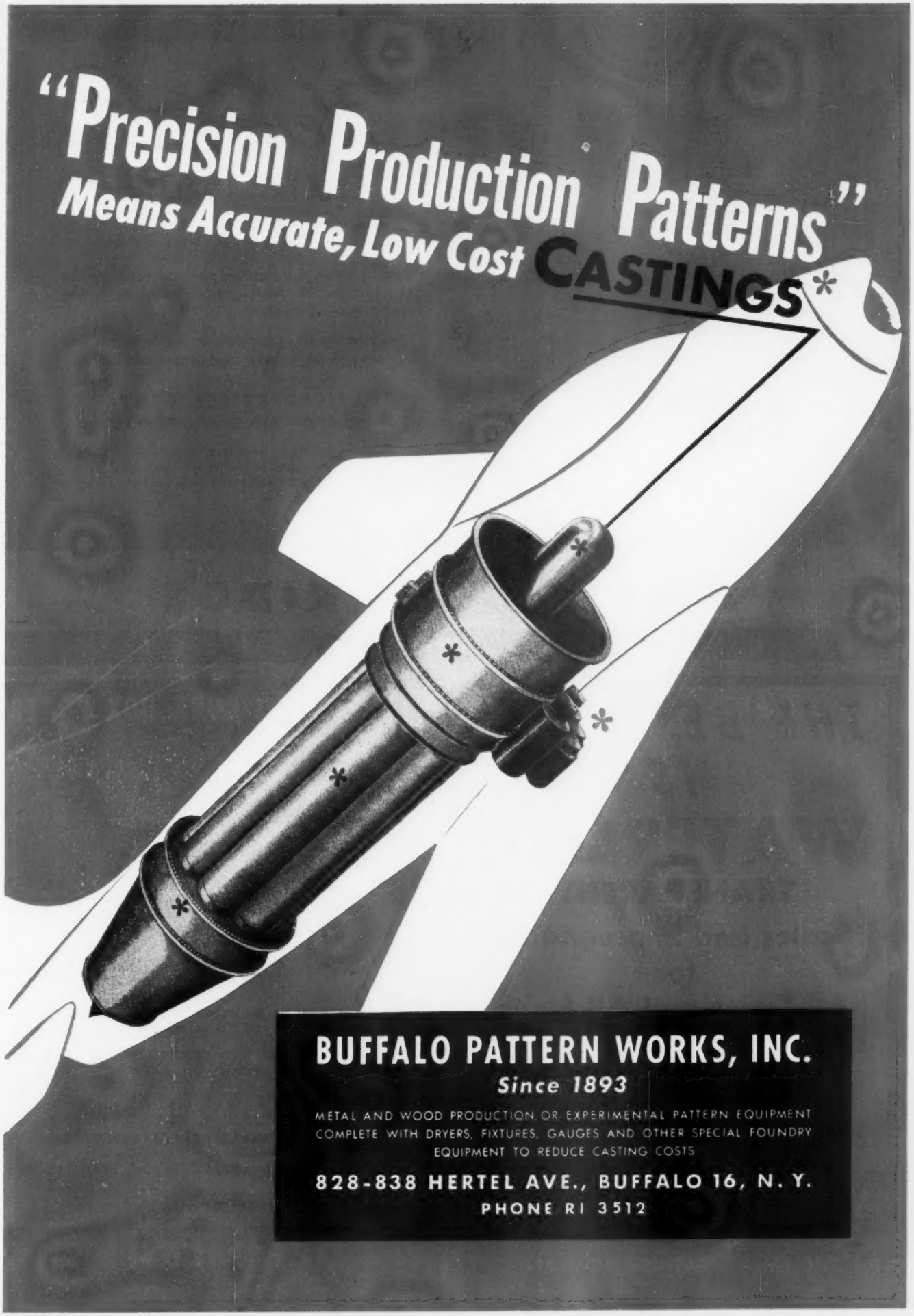

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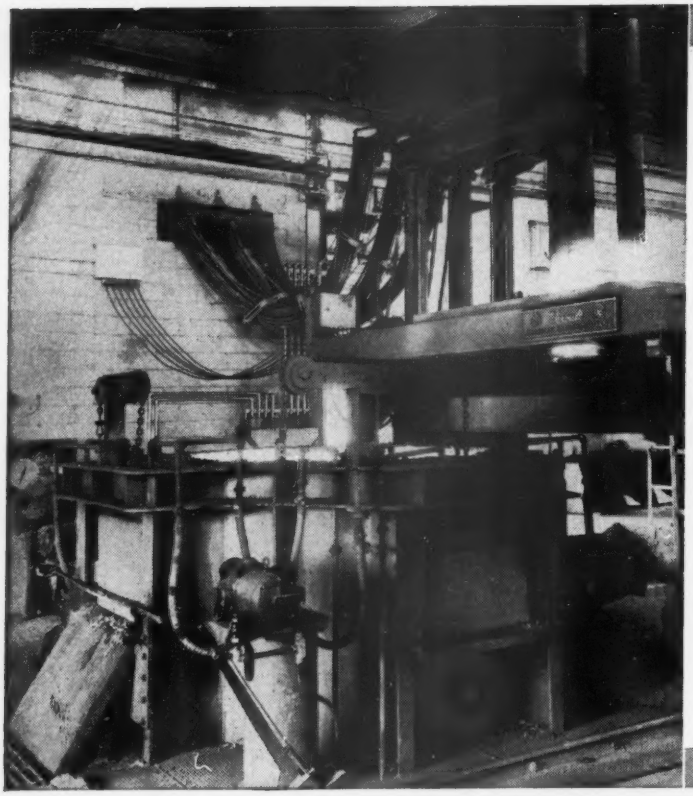

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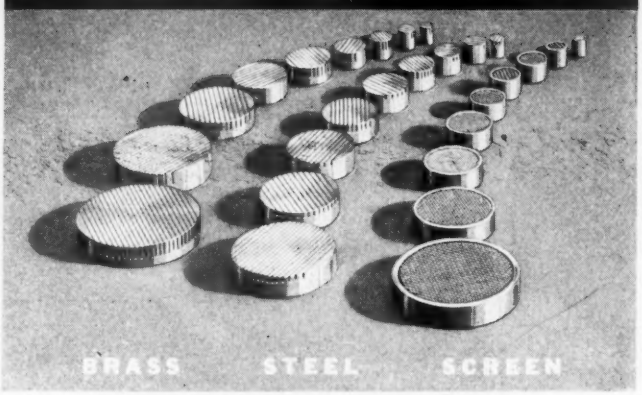

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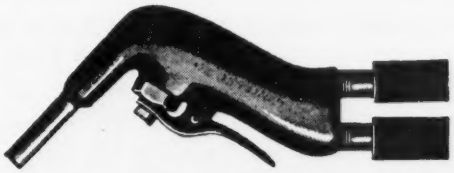

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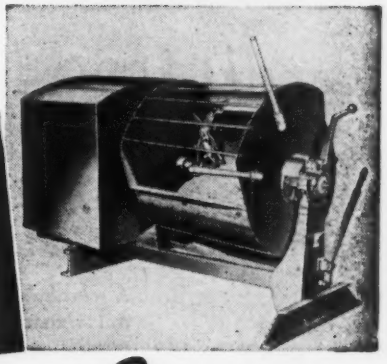

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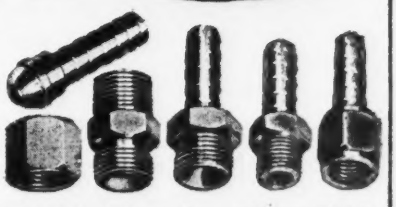

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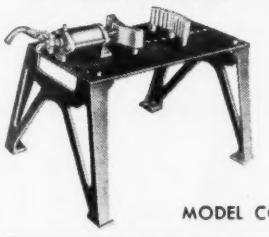


MODEL CG-2

Now . . . the operator can clean and snag twice as many castings because no time is lost trying to get a firm hold on the casting. He can bear down with the grinding wheel because the casting can't fly loose, and he won't lose time if the casting gets hot. Castings are gripped slowly and deliberately, but released instantly by the control of one, easy-to-operate, pneumatic valve. ● Investigate JOY Casting Grips—*you can cut costs with them!*

WRITE FOR CATALOG 76-M

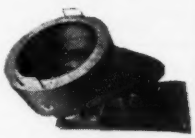
WAD 3664

JOY MANUFACTURING COMPANY
OLIVER BUILDING • PITTSBURGH 22, PA.

CENTRIFUGAL CASTING MACHINES

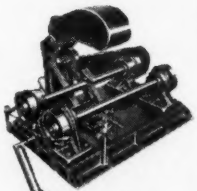
Model AS

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.



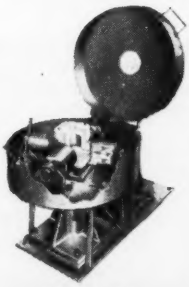
Model J

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.



Model M

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.



Model J-P

CENTRIFUGAL CASTING MACHINE COMPANY
Nathan Janco, *President*
P. O. Box 947 Tulsa 1, Okla.

oily or hot—here's your BEST BELTING BUY!

more **FLEXIBLE**
•
extra **STRENGTH**
•
more **DURABLE**
•
resists **BUCKET BOLT PULL-OUTS**
•
effectively **PRE-STRETCHED**
•
scientifically **CURED**

If you want the very best—if *quality* is your economy—you'll want the facts on Dandux foundry belts for elevating and conveying . .

DANDUX STANDARD NO. 60-10 gives unusually long and superior service with oily core sand and cold sand.

DANDUX PYROFLEX NO. 60-20 beats the heat up to 300° F.

DANDUX INSULEX NO. 60-25 does likewise up to 450°. But you *can't beat*

DANDUX DOUBLE INSULEX NO. 60-26 for heat resistance with temperatures above 450° F. Dandux belts are designed with the installation in mind.

Canvas Stitched Belting

Your inquiry is invited. Dandux' staff reflects more than 30 years of scientific and practical engineering experience . . . in the lab and on the job.

INNER-SEWED — DANDUX BELTING — LOCK-STITCHED

QUALITY • INTEGRITY • CRAFTSMANSHIP

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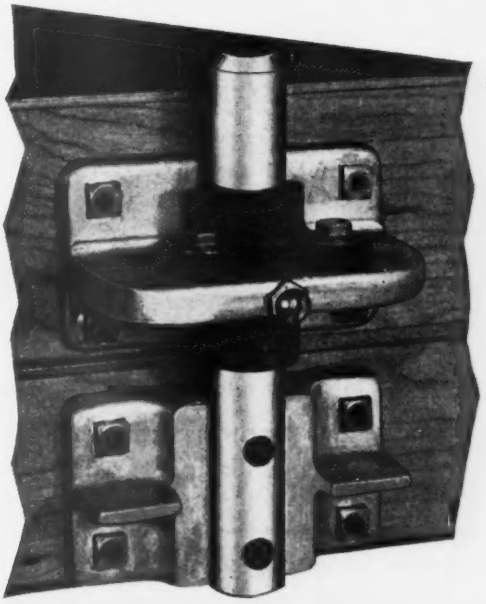
BALTIMORE 16, MD. 4900 Wetheredsville Rd.

Offices In Principal Cities

V-G CHERRY SNAP FLASKS

Featuring the

V-G ROUND PIN ASSEMBLY



ONE INCH ROUND STEEL PIN HARDENED and RUSTPROOF DOUBLE LIFE—REVERSIBLE

REMOVE CAP SCREWS AND ROTATE PIN 180 DEGREES.

ALUMINUM PIN BASE AND COPE EAR ADJUSTING SCREW FOR COPE GUIDE

V-G Flasks are seasoned cherry with new hook-type latches that never loosen. Adjustable hinges are screwed AND bolted to the flask. Wear strips of either steel or HARDENED-24ST- Aluminum are available. Other standard pins also available.

Shipments can be made promptly

Write for complete information

Correspondence invited from Distributors

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MADISON, CONNECTICUT

A BLAST FURNACE PRODUCT

Smelted from Superior quality lake ores, high grade metallurgical coke and limestone, using our own local No. 1 Sharon Seam coal.

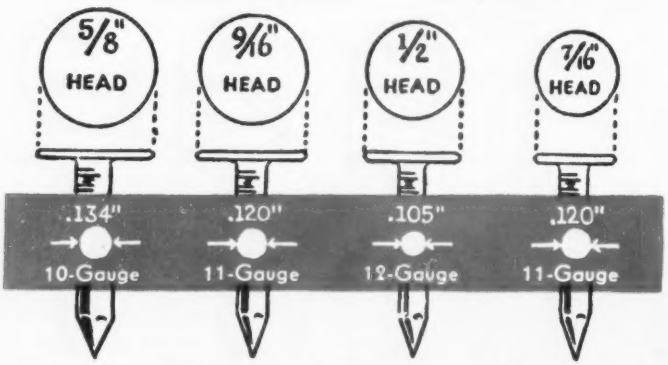
HIGH SILICON IRON JISCO

A "blend" with JISCO is sound metallurgy.

THE JACKSON IRON & STEEL *Company*
JACKSON, OHIO

ANGELL . . . PROVEN PRESSURE PROOF CHAPLETS

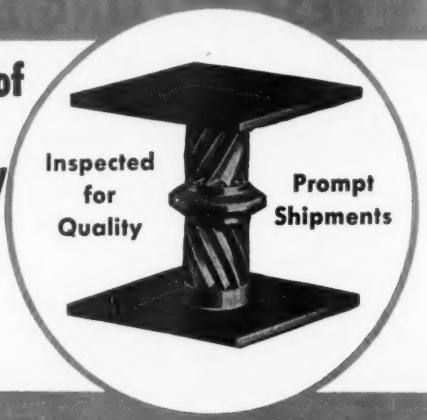
Producers of SUPER HEAD FOUNDRY NAILS



⅝", 9/16" & ½" Heads available up to 3 inches in length

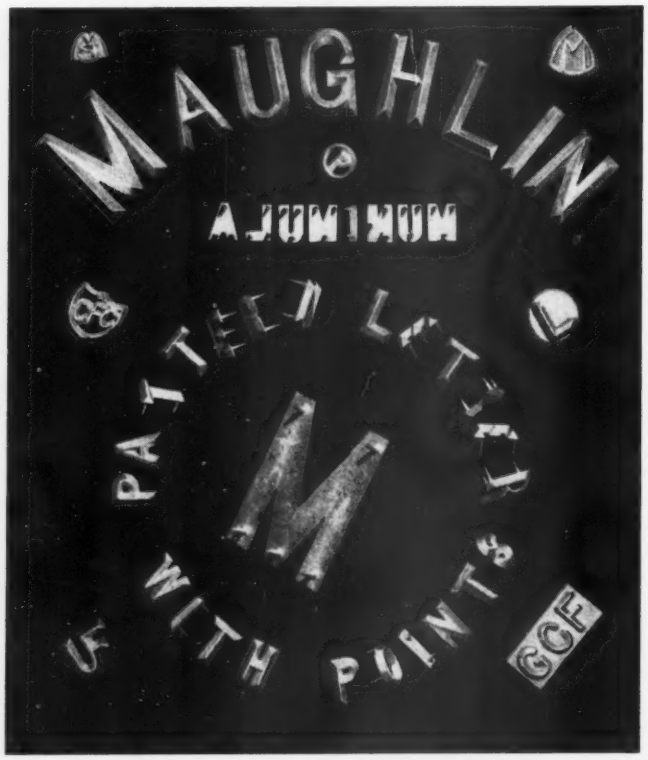
Standard Foundry Nails available in all lengths.

All styles of Chaplets Accurately Made for Better Castings



THE ANGELL NAIL & Chaplet Company
4580 East 71st Street
CLEVELAND 5, OHIO

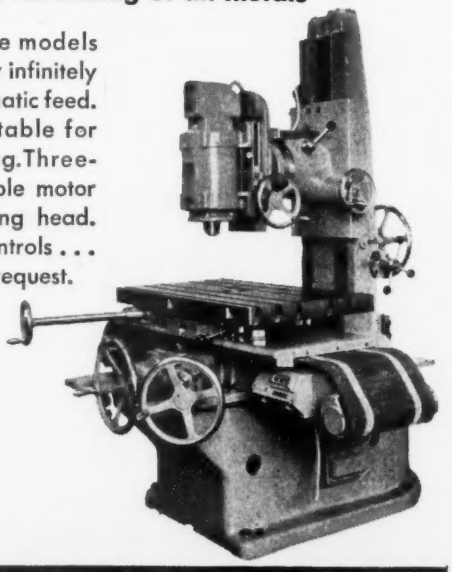
A Hammer Blow Secures Letters To Pattern



THE H. P. MAUGHLIN CO.
953 Ingleside Ave., Columbus, Ohio
Manufacturers of letters and numbers exclusively for over 30 years

BOKE *UNIVERSAL HIGH-SPEED*
MILLING MACHINES
for precision pattern making and machining of all metals

TWO versatile models with manual or infinitely variable automatic feed. Rotary work-table for circular milling. Three-speed, reversible motor serves as milling head. Convenient controls . . . Particulars on request.



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HARD CHROMED • PORTABLE PNEUMATIC TOOLS

DO MORE WORK AT LESS COST

because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS

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IF YOUR PROBLEM INCLUDES

chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

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JOLT SQUEEZER

This portable jolt squeezer is furnished in two sizes: 10" squeeze cylinder with 3" jolt cylinder and 12" squeeze cylinder with 4" jolt cylinder. Jolt tables 17" x 20" and 19" x 22".

The post and squeeze cylinder are cast in one piece. Top of post machined to take 2-7/16" cold rolled shaft for the swing arm. Zerk fittings throughout.

No bolts or screws in this machine!

FULLY EQUIPPED

Equipped with air gauge, pop-off gauge and pin for gate horn.

The price will interest you!

HAYNES FOUNDRY EQUIPMENT CO.

814 ADA ST., KALAMAZOO, MICH.

LADLES—BRASS FURNACES—CORE OVENS

THE CASTING THIS SAVES MAY BE YOUR OWN . . . !

Send coupon today

Cleaner castings, less scrap loss and higher production will be the effort of the entire foundry industry to meet the emergency production all foundries will be asked to undertake.

If you have never used BLOOMSBURY FOUNDRY FACINGS, you will be amazed at the results.

- [1] **BLACKINGS . . .**
- [2] **CORE WASHES . .**
- [3] **PLUMBAGO . . .**
- [4] **PIPE ELIMINATOR**

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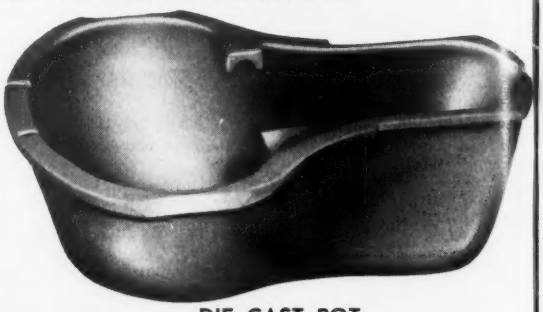
MELTING POTS—Ingot Molds

FOR NONFERROUS METALS FROM ACME SPECIAL FORMULA

SPOUT POT
NO. 550A



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HOLDING BOWL
NO. HP7001

WRITE FOR
SCHEDULE OF 40 SIZES

ACME FOUNDRY COMPANY

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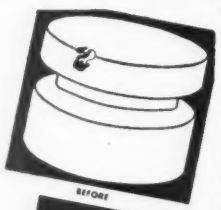
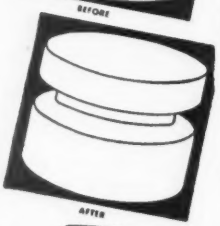
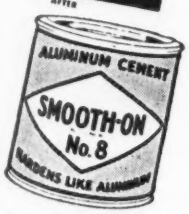
For Surface Blemishes in ALUMINUM CASTINGS





Have you used the Smooth-On Foundry Cement made especially to correct blow holes, porous and rough spots, dents and other unsightly but harmless surface defects in otherwise sound *aluminum* alloy castings?

Applied like the widely used Smooth-On *Iron* Foundry Cement, Smooth-On No. 8 *Aluminum* Cement fills in evenly, hardens quickly, matches perfectly. Stays in place, too, for it expands slightly as it sets.



Smooth-On No. 8 Aluminum Cement comes in 1- and 5-lb. sizes. 1 lb. will fill 17 cu. in. Order it by NAME AND NUMBER from your supply house. If they haven't it, write us. If you have not yet discovered Smooth-On No. 8, ask us for

FREE SAMPLE TO TEST

You'll receive also the famous 40-page SMOOTH-ON HANDBOOK, filled with industrial uses for the various Smooth-On Cements. 170 illustrations. Write today.

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570 Communipaw Ave., Jersey City 4, N. J.

Do it with **SMOOTH-ON**
No. 8 ALUMINUM CEMENT

TERRE HAUTE
SPECIAL
FOUNDRY COKE

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A QUALITY PRODUCT

Sold Exclusively by
REPUBLIC COAL & COKE CO.
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BRANCHES: Peoria • New York • Indianapolis • Milwaukee • Minneapolis • St. Louis
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Manufactured at Terre Haute, Indiana by INDIANA GAS & CHEMICAL CORPORATION

WADSWORTH

STOCK CORE MACHINES

Produce Round, Square, Rectangular, Triangular, Oval, Hexagon, and Irregular Shaped Extruded Cores Faster and More Economically

In Sizes Ranging From 3/8" to 7"

Manufactured By :

WADSWORTH EQUIPMENT CO.

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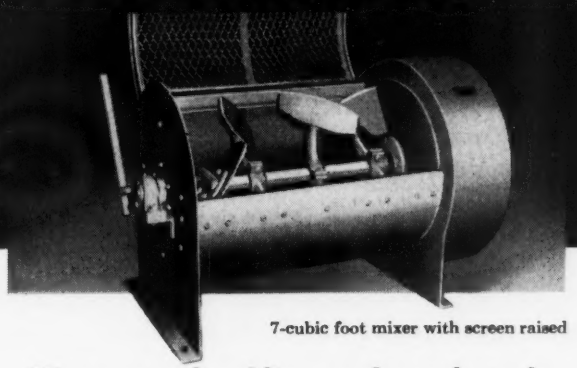
Rapid Model
3/8" to 3"
Capacity

FASTER, BETTER MIXING
Lowers Your Operating Cost



7-cubic foot mixer with screen raised

Mix core and molding sands, and cupola patch mixes with MULTI-BLADE MIXERS

- THEY'RE FAST . . . mix and discharge a load in four and a half minutes.
- THEY MIX BETTER . . . the best blade arrangement in any mixer . . . cuts, turns and kneads the mix ten times with every shaft revolution.
- THEY'RE QUALITY BUILT . . . trouble free, self-contained, have anti-friction bearings, direct drive (no clutch or belts), and come in sizes from 3 to 60 cu. ft. capacities. Special and larger mixers also available.

Get these advantages and resultant savings. See your foundry equipment dealer or write direct to

MULTIPLEX MACHINERY CORP. ELMORE OHIO

a **BETTER CHAPLET**

OPEN HEAD

Sand packs better under head and around stem

REDUCES CASTING REJECTS

THE DESIGN of this Shoulder Radiator Chaplet (patented) ensures more rigid support for cores. THE QUALITY has been proven over many years of dependable service.

We also make Motor and Boiler Chaplets: Forged Head, Fitted Head, Double Head and other types.

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CLEVELAND CHAPLET & MFG. CO.,
1197 West 67th Street
CLEVELAND, OHIO

CLEVELAND *Chaplets*
Since 1890

ATLANTIC Band Saws

The Favorite Blades of Non-Ferrous Foundries for Over 20 Years

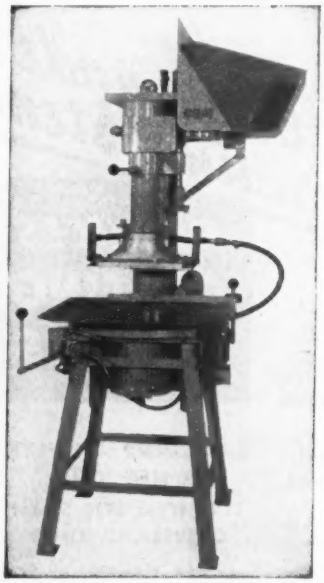
You will profit by using the tougher Atlantic blades for clean, speedy cutting of gates and risers from castings. You can eliminate unnecessary grinding operations—our specially milled tooth construction makes it easier to cut closer to the body of the casting. All Atlantic Metal Cutting Band Saws are guaranteed as to material, workmanship and temper.

Send for Atlantic Band Saw Catalog,
describing foundry cut-off operations.

ATLANTIC SAW MANUFACTURING CO.
Exclusively Band Saw Production

159 BREWERY ST.,
NEW HAVEN 11, CONN.

◂COR-BLO▸ AUTOMATIC



HIGH DRAW MODEL "C-H-E"

Cores up to 8 lbs.

With the operation of one lever on the hand machine, or pushing of one button on the electric cycle, this machine will —Close the Core Box—Blow the Cores—Vibrate the Box—Draw the Cores—and Eject the Core Box to position where the dryer is applied. Produces more cores with less operator fatigue, and more cores per hour.

Let us figure on your requirements.

HARRISON MACHINE COMPANY
Wesleyville, Erie, Pa.

Need More Capacity?

FERGUSON
- *DESIGNS*
- *BUILDS*
- *EQUIPS*

Whatever your requirements—a complete new Foundry—or modernization of your present facilities—call on a Ferguson First Team of foundry specialists for a qualified analysis, and a practical solution of your problem.

Preliminary Discussions in Confidence and Without Obligation.

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Headquarters: **Ferguson Building, Cleveland, Ohio**
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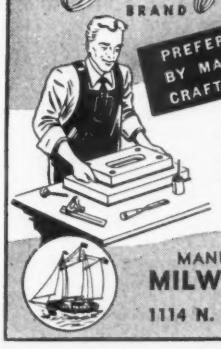
"Craft" BRAND LEATHER FILLET



PREFERRED BY MASTER CRAFTSMEN

Write for samples and quotations.
Immediate shipment from stock.

- **PLIABLE**
  Easy to work with.
- **FINE FEATHER EDGE**
  Fine bevel edge fits perfectly.
- **CUT TO CORRECT RADIUS**
  Correct when pressed into place.

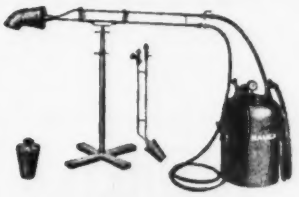
MANUFACTURED BY
MILWAUKEE LEATHER BELTING CO.
1114 N. Water St. Milwaukee 2, Wis.

HAUCK OIL AND GAS BURNING EQUIPMENT

for
- CUPOLA LIGHTING
- MOLD DRYING
- LADLE HEATING
- CORE BAKING
- FURNACE HEATING

Featuring
3 BIG OPERATIONS WITH 1 EQUIPMENT

Compressed air portable oil burner equipment for lighting cupolas and drying molds. Also hand pump types.



This Hauck All-Purpose Unit with interchangeable Burners and Nozzles, lights cupolas, heats ladles, dries molds. Fast, efficient—easy to handle. Burner flame adjustable and can be directed from any angle. Nothing like it for superior performance. Get Hauck Foundry Catalog.

Venturi compressed air "suction" hand torches — no preheating, for drying linings, cores, molds.

Portable venturi high pressure oil burners with adjustable burner stand for heating and drying ladles.

Venturi low pressure and high pressure air atomizing oil burners for ladle heating, core and mold ovens, melting and annealing furnaces.

HAUCK MANUFACTURING CO.
106 Tenth St., Brooklyn 15, N. Y.

Reduce Use of Chills in Gray Iron Casting

Now all you have to do to get hard chilled iron is add

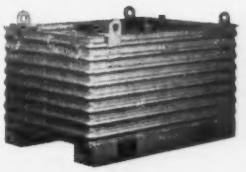
TELLURIUM

Comes in 1, 2, 3 and 4-gram tablets; also in powder, slabs and sticks. For full information, write Dept. LM for 8-page article. "Use of TELLURIUM In Promoting Chills On Gray Iron Castings."

American Smelting and Refining Company
120 BROADWAY • NEW YORK 5, N.Y.

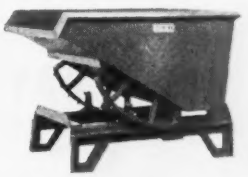
Here's why rugged BRUSCO handling equipment increases foundry efficiency

BRUSCO CORRUGATED STEEL BOXES



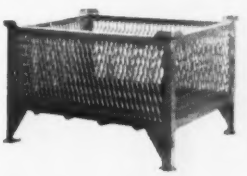
Save floor space — stack safely from floor to roof. Four way entry for fast, efficient handling. Equipped with crane lugs for movement by crane. Fabricated from heavy gauge corrugated steel to give added rigidity and maximum strength. Thoroughly and securely arc welded for longer, maintenance free life. Made in various sizes and load capacities to suit your requirements.

BRUSCO SELF-DUMPING HOPPER



Speeds production and saves labor in handling parts and materials in your foundry. Easy to move and simple to operate. Hopper is fabricated of heavy steel plate thoroughly reinforced. This unit is equipped with a new, cast steel rocker and hardened pins for longer service. Made in ½, 1, 1½ and 2 cubic yard capacities. Underclearance optional.

BRUSCO CASTING COOLING BOXES



Shortens cooling time. Stacks quickly, safely and saves vital floor space. Made in sizes and load capacities to fit your particular requirements.

These are only a few of the *Standard* items in the complete BRUSCO material handling line for foundries. These and the many other BRUSCO units can be built to meet your specific needs. Remember, every BRUSCO material handling unit is built to speed, simplify and ease your Foundry materials handling. Write today for full information.

Brusco
HANDLING EQUIPMENT
BRUMMELER STEEL PRODUCTS CORPORATION
1412 Ionia Ave., S. W. Grand Rapids, Michigan

ALL GRADES OF WASHED, DRIED, SCREENED

SILICA FOUNDRY SANDS

Produced from the celebrated Ottawa District St. Peter Sandstone

Steel Molding Sand • Core Sand • Blast Sand • Furnace Bottom Sand
Opener Sand • Sand for Non-Ferrous, Aluminum, Magnesium Castings
Sands for Croning "shell" process, and for precision castings.
MICROSIL Ground Silica (5 Standard Grades of pure white Silica Flour)

MICROSIL GROUND SILICA

STANDARD SILICA CORPORATION

209 South LaSalle Street, Chicago; plants at Ottawa, Illinois
DISTRIBUTORS IN ALL PRINCIPAL CITIES

BLACKHAWK SILICA SAND

COST CONTROL
WESTOVER ENGINEERS

Westover ENGINEERS

FOUNDRY MANAGEMENT CONSULTANTS
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Permit us to show you how "satisfactory" operations can be improved.

TUMBLING BARRELS

Roller Bearing throughout
Direct Motor Drive with Speed Reducer
V Belt Motor Drive—Tight & Loose Pulley Drive
ROYERSFORD FOUNDRY & MACHINE CO.
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EMPIRE THAT GOOD By-Product Coke:

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No. 4 DAYTON RING VALVE BENCH RAMMER

MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

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Manufacturers of Pneumatic Tools Since 1903

DAYTON, OHIO

PURO-SEAL FLUX

for producing BETTER BRASS *and* ALUMINUM CASTINGS

★ BALANCED FLUX

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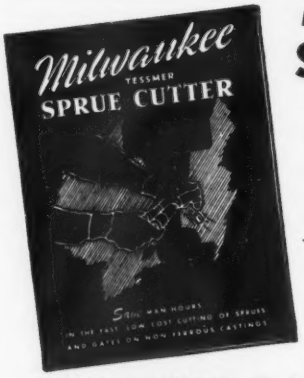
PURO SEAL FOR THE PURIFICATION OF METALS

THE PURO-SEAL COMPANY
2323 WEST 3rd STREET · CLEVELAND 13, OHIO



MILWAUKEE-TESSMER

Sprue Cutter

for

Non-Ferrous Foundries

- Cuts Sprues and Gates with One, Swift, Sure Stroke.
- Does away with tedious hand labor.
- Speeds flow of work through cleaning department.
- Built for years of Rugged, Low-Cost Service.
- 2 Sizes, ¾" and 1¼" square. Built-in electric motor or belt drive.

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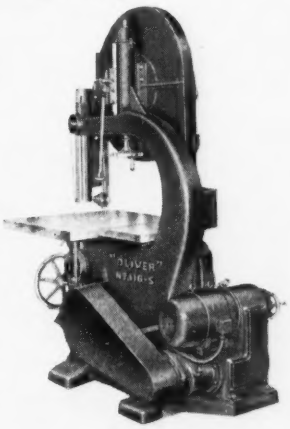

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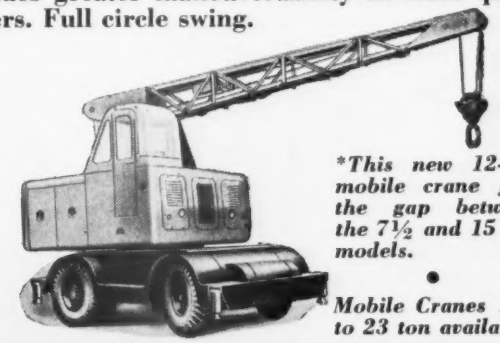

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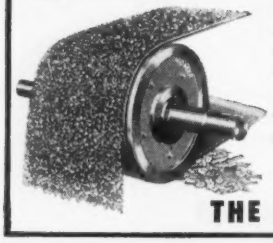

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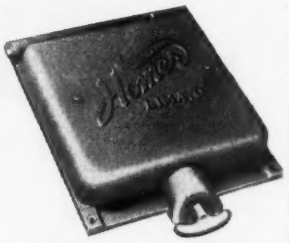

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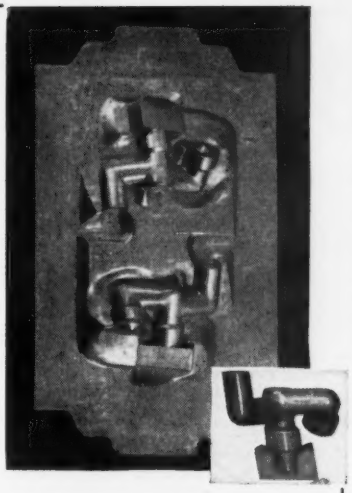

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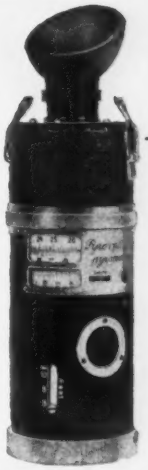

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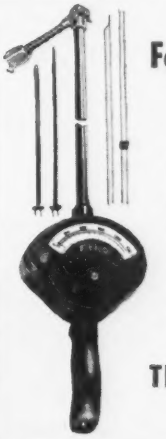

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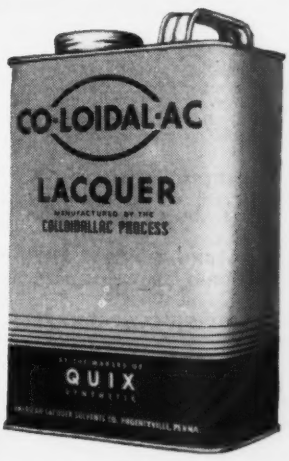

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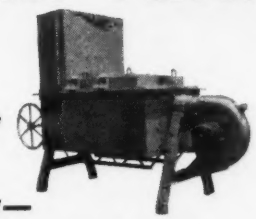

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BUSHINGS (Blow-plate)

Martin Engineering Co., Kewanee, Ill.

BUSHINGS (Flask-Pin)

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Smillie & Co., C. M., 1124 Woodward Hgts. Blvd., Ferndale 20, Mich.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Universal Engineering Co., Frankenmuth, Mich.

CALCIUM BORIDE

Molybdenum Corporation of America, Pittsburgh 19, Pa.

CALCIUM MOLYBDATE

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Molybdenum Corporation of America, Pittsburgh 19, Pa.

CARBON BOOSTER

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
United States Graphite Co., Saginaw, Mich.

CARS (Core Oven)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

CARS (Mold Drying)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

CASTING GRIPS (Air Powered)

Joy Mfg. Co., Joy Division, Pittsburgh, Pa.

CASTING MACHINES (Centrifugal)

Centrifugal Casting Mach. Co., Tulsa, Okla.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

CASTING MACHINES (Permanent Mold)

Centrifugal Casting Machine Co., Tulsa, Okla.

CASTING PLATER

United States Gypsum Co., 300 W. Adams St., Chicago, Ill.

CASTING SEALER

Empire Varnish Co., 2636 E. 76th St., Cleveland 4, Ohio.
Tincher Products Co., Sycamore 12, Illinois
Tousey Varnish Co., 520 West 25th St., Chicago 16, Ill.

CASTINGS

City Pattern Foundry & Machine Co., 1161 Harper, Detroit 11, Mich.

CEMENT (Metallic)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Smooth-On Manufacturing Co., 570 Communipaw Ave., Jersey City 4, N. J.

CEMENT (Refractory)

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Norton Co., Worcester 6, Mass.

CEREAL BINDERS

Chas. A. Krause Milling Co., 404 East State St., Milwaukee, Wis.

CHAIN (Hoist, Conveyor, Drive, Sling, etc.)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.

CHAIN (Welded and Weldless)

Chisholm-Moore Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.

CHAPLETS

Angell Nail & Chaplet Co., 4580 E. 71st St., Cleveland, Ohio.
Chicago Chaplet Co., 2047 North Wood St., Chicago 14, Ill.
Cleveland Chaplet & Mfg. Co., 1197 W. 67th St., Cleveland 2, O.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich.
Fanner Mfg. Co., Brookside Park, Cleveland 2, Ohio.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee 4, Wis.
Frederic B. Stevens, Inc., Detroit 16, Mich.

CHARCOAL (Briquets)

Ford Motor Co., Iron Mountain, Mich.

CHEMICALS

Atlantic Chemical & Metals Co., 1925 N. Kenmore, Chicago 14, Ill.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., Mathieson Bldg., Baltimore 3, Md.
Monsanto Chemical Co., 1700 S. 2nd St., St. Louis 4, Mo.

CHEMISTS

Crobaugh Co., Frank L., 1426 West Third St., Cleveland 13, Ohio.
Chas. C. Kawin Co., 431 S. Dearborn St., Chicago 5, Ill.

CHILLS

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
Angell Nail & Chaplet Co., 4580 E. 71st St., Cleveland, Ohio.
Chicago Chaplet Co., 2047 North Wood St., Chicago 14, Ill.
Fanner Mfg. Co., Brookside Park, Cleveland 2, Ohio.
Milwaukee Chaplet & Mfg. Co., 1023 So. 40th St., Milwaukee 4, Wis.
Standard Horse Nail Corp., New Brighton, Pa.

CHILL COATINGS

Acheson Colloids Corp., Port Huron, Mich.

CHILL NAILS

Angell Nail & Chaplet Co., 4580 E. 71st St., Cleveland, Ohio.
Standard Horse Nail Corp., New Brighton, Pa.

CHIPPERS—See PNEUMATIC TOOLS

CHISELS (Chipping)

Arrow Tools, Inc., 1900 S. Kostner, Chicago, Ill.
Cleco Division of Reed Roller Bit Co., Houston, Texas.
Independent Pneumatic Tool Co., Aurora, Ill.

CHROMIUM (Briquets)

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

CLAMPS (Flask)

Diamond Clamp & Flask Co. Richmond, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Sterling Wheelbarrow Co., 1700 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

CLAY (Bonding)

American Colloid Co., Merchandise Mart Plaza, Chicago 54, Ill.
Carpenter Brothers, Inc., 606 West Wisconsin 3, Mo.
Baroid Sales Division, 637 Railway Exchange Bldg., 80 East Jackson Blvd., Chicago 4, Ill.
Eastern Clay Products, Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.

CLAY (Refractory)

Carpenter Brothers, Inc., 606 West Wisconsin 3, Mo.
Eastern Clay Products Inc., Jackson, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.

CLEANING COMPOUNDS

Pelron Corp., 7740 West 47th St., Lyons, Illinois

CLEANING EQUIPMENT (Castings)

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Arrow Tools Inc., 1900 S. Kostner, Chicago, Ill.
Pangborn Corp., Hagerstown, Md.

CLUTCHES (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.,
Stearns Magnetic Mfg. Co., 622 S. 28th St., Milwaukee 4, Wis.

COKE (Foundry)

DeBardeleben Coal Corp., 2201 First Ave., N., Birmingham 3, Ala.

COKE (Foundry) (Cont'd.)

Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Philadelphia Coke Co., 4501 Richmond St., Philadelphia 37, Pa.
Pickands, Mather & Co., Cleveland 14, O.
Republic Coal & Coke Co., 8 So. Michigan Ave., Chicago 3, Ill.
Semet Solvay Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

COKE (Petroleum)

Republic Coal and Coke Co., 8 S. Michigan Ave., Chicago 3, Ill.

CONVERTER BLOWERS

Roots-Connersville Blower Corp., Connersville, Ind.

CONVERTERS (Bessemer)

Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

CONVEYOR DESIGN

Giffels & Valet, Inc., Marquette Bldg., Detroit, Mich.

CONVEYORS (Belt)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The 2424 No. Cicero, Chicago 39, Ill.
Boston Woven Hose & Rubber Co., 29 Hampshire, Cambridge 39, Mass.
Imperial Belting Co., 1800 So. Kilbourn Ave., Chicago 23, Ill.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Chain)

Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Gravity)

Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Live Roller)

Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Magnetic)

Stearns Magnetic Mfg. Co. 662 S. 28th St., Milwaukee 4, Wis.

CONVEYORS (Monorail)

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 E. 283rd St., Wickliffe, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Penn Iron Works, Reading, Pa.

CONVEYORS (Overhead)

Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

CONVEYORS (Pneumatic)

Fuller Company, Catasauqua, Pa.

CONVEYORS (Portable-Gas Electric)

Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

CONVEYORS (Rubber)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Vibrating)

Ajax Flexible Coupling Co., Westfield, N. Y.
Jeffrey Mfg. Co., 907 N. Fourth St., Clumbus 16, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Simplicity Engineering Co., Durand, Mich.
Syntron Company, Homer City, Pa.

COPPER

Federal Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

COPPER SHOT

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

CORE BINDERS

American Gum Products Co., 500 Fifth Ave., New York 18, N. Y.
Archer-Daniels-Midland Co., Werner G. Smith Div., 2191 W. 110th St., Cleveland 2, O.
Bakelite Corp., 300 Madison Ave., New York 17, N. Y.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Corn Products Sales Co., 17 Battery Pl., New York 4, N. Y.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Rubber Inc., Bethesda, Md.
General Electric Co., Pittsfield, Mass.
Hercules Powder Co., Wilmington 99, Del.
E. F. Houghton Co. 303 W. Lehigh Ave., Philadelphia 33, Pa.

CORE BINDERS (Cont'd.)

Chas. A. Krause Milling Co., 404 E. State St., Milwaukee 1, Wis.
Monsanto Chemical Co., Plastic Division, Springfield 2, Mass.
Pelron Corp., 7740 West 47th St., Lyons, Illinois
Robeson Process Co., 500 Fifth Ave., New York 18, N. Y.
Frederic B. Stevens, Inc., Detroit 16, Mich.
United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.
Werner G. Smith, Inc. Union Commerce Bldg., Cleveland 14, Ohio.

CORE BLOWER BUSHINGS

Eastern Clay Products, Inc. Jackson, Ohio.
Martin Engineering Co., Kewanee, Ill.

CORE BLOWING MACHINES

Champion Foundry & Machine Co. 1553 W. Madison St., Chicago 7, Ill.
Wm. Demmler & Bros., Kewanee, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Harrison Machine Co., Wesleyville, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

CORE BOXES

Accurate Match Plate Co., 1847 W. Caroll St., Chicago, Ill.
Atlas Plastic and Aluminum Pressure Plate Co., Butler, Wis.

CORE COLORING

Eaton Chemical & Dyestuff Co. 1490 Franklin, Detroit, Mich

CORE COMPOUND

Archer-Daniels-Midland Co., Werner G. Smith Div., 2191 W. 110th St., Cleveland 2, O.
Bakelite Corp., 300 Madison Ave., New York 17, N. Y.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Rubber Inc., Bethesda, Md.
Pelron Corp., 7740 West 47th St., Lyons, Illinois
Frederic B. Stevens, Inc., Detroit 16, Mich.
Werner G. Smith, Inc., Union Commerce Bldg., Cleveland 14, O.

CORE DRAWING MACHINES

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O
Freeman Supply Co., Toledo 5, O
Newaygo Engineering Co., Newaygo, Mich.

CORE DRIERS (Dielectric)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

CORE FLUXES (Aluminum, Magnesium)

Pelron Corp., 7740 West 47th St., Lyons, Illinois

CORE GRINDERS (Power Operated)

Jeffrey Mfg. Co., Columbus 16, O.

CORE GRINDERS (Power Operated) (Cont'd.)

Milwaukee Foundry Equipment Div., Spo Inc., 3328 Pierce St., Milwaukee 4, Wis.
Standard Pattern Works, 6771 E. McNichols, Detroit 12, Mich.
Sutter Products Co., Dearborn, Mich.

CORE KNOCKOUT MACHINES

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Pangborn Corp., Hagerstown, Md.
Simplicity Engineering Co., Durand, Mich.

CORE MAKING MACHINES

Champion Foundry & Machine Co., 1553 W. Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Wm. Demmler & Bros., Kewanee, Ill.
Federal Foundry Suppy Co., 4600 E. 71st St., Cleveland 5, O.
Harrison Machine Co., Wesleyville, Pa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Milwaukee Foundry Equipment Div., Spo Inc., 3328 Pierce St., Milwaukee 4, Wis.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.
Sutter Products Co., Dearborn, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Wadsworth Equipment Co., 555 Lafollette St., Akron, Ohio.

CORE OILS

Archer-Daniels-Midland Co., Werner G. Smith Div., 2191 W. 110th St., Cleveland 2, O.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Petron Corp., 7740 West 47th St., Lyons, Illinois
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Frederic B. Stevens, Inc., Detroit 26, Mich.
United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.
Werner G. Smith, Inc., Union Commerce Bldg., Cleveland 14, Ohio.

CORE OVENS

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, O.
Despatch Oven Co., Minneapolis 14, Minn.
Drying Systems, Inc., 1801 Foster Ave., Chicago 40, Ill.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, O.
Girdler Corp., Thermex Division, 224 E. Broadway, Louisville 2, Ky.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo, Mich.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
J. O. Ross Engineering Corp., 444 Madison Ave., New York 17, N.Y.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

CORE PASTE

Corn Products Sales Co., 17 Battery Pl., New York 4, N. Y.
Delta Oil Products Co., Milwaukee 9, Wis.
Eastern Clay Products Co., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE PASTE (Cont'd.)

Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

CORE PLATES (Magnesium)

Christiansen Corp., 1515 No. Kilpatrick, Chicago 51, Ill.

CORE PLATES (Steel, Asbestos)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.
Diamond Clamp & Flask Co., Richmond, Indiana
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Johns-Manville, 22 E. 40th St., New York 16, N. Y.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

CORE ROD STRAIGHTENING and CUTTING MACHINERY

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE SAND

Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
Weldron Silica Co., 38 So. Dearborn St., Chicago, Ill.

CORE SAND MIXERS

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Standard Sand & Machine Co., Blystone Div., 549 W. Washington Blvd., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Federal Foundry Supply Co., 4600 E.71st St., Cleveland 5, Ohio.
Multiplex Machinery Corp., Elmore, Ohio.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Posey Iron Works Inc., Lancaster, Pa.
Royer Foundry & Machine Co., Kingston, Pa.

CORE SPRAYERS

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

CORE STRIPPERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE TRAYS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

CORE TRUCKS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

CORE VENTS

Demmler, Wm., & Bros., Kewanee, Ill.
Smillie, C. M. & Co., 1124 Woodward Heights Blvd., Ferndale 20, Mich.
United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

CORE WASH

Acheson Colloids Corp., Port Huron, Mich.
Bloomsbury Graphite Co., Bloomsbury, N. J.
Carborundum Co., Perth Amboy, N. J.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Corn Products Sales Co., 17 Battery Pl., New York City 4.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Stevens, Frederic B., Inc., Detroit 26, Mich.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.
United States Graphite Co., Saginaw, Mich.

CORE WIRES

Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich.

CORES (Annealing)

Pressed Steel Co., Wilkes-Barre, Pa.

COUPLINGS (Air Line)

Cleco Division of Reed Roller Bit Co., Houston, Tex.
A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn 17, N. Y.

CRANE LUBRICATING SYSTEMS

Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.

CRANES (Bucket)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Electric Tramrail)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.

CRANES (Electric Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Erie Steel Construction Co., Erie, Pa.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Gantry)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Wellman Engineering Co., 7000 Central Ave., Cleveland 4, O.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Hand Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, Ohio.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Jib)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Monorail)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.

CRANES (Self-Propelled)

Coles Cranes Inc., 4318 So. Paulina, Chicago 9, Ill.
Silent Hoist & Crane Co., 835 63rd St., Brooklyn 20, N. Y.

CRAYONS (Marking)

Markal Co., 3052 W. Carroll, Chicago 12, Ill.

CRUCIBLES

American Crucible Co., North Haven, Conn.
Bay State Crucible Co., Taunton, Mass.
Electro Refractories & Abrasive Corp., Vars Bldg., Buffalo 2, N.Y.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co., Pittsburgh, Pa.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Vesuvius Crucible Co., Swissvale, Pa.

CRUCIBLE FURNACES

Ajax Electrothermic Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

CRUCIBLE LIFTERS

Modern Equipment Co., Port Washington, Wis.

CRUCIBLE POURING DEVICES

Modern Equipment Co., Port Washington, Wis.

CRUSHERS (Core)

Simplicity Engineering Co., Durand, Mich.

CUPOLAS

Foundry Service and Equipment Corp., Markham, Ill.
Modern Equipment Co., Port Washington, Wis.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Roots-Connersville Blower Corp., Connersville, Ind.

CUPOLA BLOWERS (Cont'd.)

Spencer Turbine Co., Hartford, Conn.

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CHARGING MACHINES

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.

Foundry Service and Equipment Corp., Markham, Ill.

Modern Equipment Co., Port Washington, Wis.

Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CONTROL EQUIPMENT

Edwin S. Carman, 1643 Lee Road, Cleveland 18, Ohio.

Foxboro Company, Foxboro, Mass.

CUPOLA DUST ARRESTORS

Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.

CUPOLA HOT BLAST EQUIPMENT

J. O. Ross Engineering Corp., 444 Madison Ave., New York 17, N.Y.

CUPOLA LININGS

Carborundum Co., Perth Amboy, N. J.

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

Ironton Fire Brick Co., Ironton, O.

United States Graphite Co., Saginaw, Mich.

CUPOLA PATCHING GUNS

Eastern Clay Products, Inc., Jackson, Ohio.

CUPOLA SPARK ARRESTORS

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUTOFF MACHINES (Abrasive)

Fox Grinders Inc., Oliver Bldg., Pittsburgh, Pa.

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

CYLINDERS (Hydraulic)

Miller Motor Co., 4027 N. Kedzie, Chicago 18, Ill.

DARK ROOM ACCESSORIES (X-Ray)

Eastman Kodak Co., Rochester, N. Y.

General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

DARK ROOM PROCESSING (Chemical Tanks, etc.)

Eastman Kodak Co., Rochester, N. Y.

DEGASIFIERS

Metalloy Corp., Rand Tower, Minneapolis 2, Minn.

Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

DEOXIDIZERS

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.

Metalloy Corp., Rand Tower, Minneapolis 2, Minn.

Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

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Carborundum Co., Perth Amboy, N. J.

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C. M. Smillie & Co., 1124 Woodward Hgts. Blvd., Ferndale 20, Mich.

VIBRATORS

Adams Co., Dubuque, Iowa.

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Cannon Vibrator Co., 1111 Power Ave., Cleveland 14, Ohio.

Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.

Davenport Machine & Foundry Co., Davenport, Iowa.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

Link Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Martin Engineering Co., Kewanee, Ill.

Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

Nichols Co., Wm. H., Richmond Hill, Long Island 18, N. Y.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

S P O Incorporated, 7500 Grand Division Ave., Cleveland 5, O.

Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

Syntron Company, Homer City, Pa.

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

VISES (Hydraulic, Mechanical, etc.)

Columbian Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland, Ohio.

Desmond-Stephen Mfg. Co., Urbana, Ohio

WASH ROOM EQUIPMENT

Bradley Washfountain Co., Box 732, Milwaukee 1, Wis.

WAX (Core, Vent, Pattern)

United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

WEDGES (Foundry)

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WEIGHING DEVICES

Toledo Scale Co., Toledo, Ohio

WELDING GAS

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING APPARATUS (Electric arc)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N.Y.

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING and CUTTING APPARATUS and SUPPLIES

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING ELECTRODES (Carbon)

National Carbon Co., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.

United States Graphite Co., Saginaw, Mich.

WELDING RODS & ELECTRODES

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WETTING AGENTS

Petron Corp., 7740 West 47th St., Lyons, Illinois

WHEELBARROWS

Sterling Wheelbarrow Co., 7100 W Walker St., Milwaukee 14, Wis

WHEELS, ABRASIVE (Cut-off)

Bay State Abrasive Products Co., Westboro, Mass.

Carborundum Co., Perth Amboy, N. J.

Electro Refractories & Abrasives Corp., Vars Bldg., Buffalo 2, N. Y.

Norton Company, Worcester 6, Mass.

Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.

Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.

Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio

WHEELS (Wire Brush)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE BENDERS

Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE BRUSHES

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE CUTTERS

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE NAILS

Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.

WOODWORKING MACHINERY

Oliver Machinery Co., Grand Rapids 2, Mich.

X-RAY EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

X-RAY FILMS

Eastman Kodak Co., Rochester, N. Y.

General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

ZINC

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

Foundries For Sale

STEEL AND BRICK CONSTRUCTED BUILDING
24,000 Square Feet
Approximately Eight Acres of Land
Railroad Siding

Suitable For

GRAY IRON AND NON-FERROUS FOUNDRY

Available Immediately

LOCATED AT MINERAL RIDGE, OHIO
RIDGE CASTING DIVISION
HELLIER COAL & COKE COMPANY
1003 Union National Bank Bldg.
Youngstown, Ohio
Phone: Youngstown 4-5394

STEEL FOUNDRY

FOR SALE

Located in Northern part of Ohio. Complete facilities.

R. SMITH

11205 BEREA ROAD CLEVELAND 11, OHIO

GRAY-IRON FOUNDRY

Brick and steel foundry with two clear spaces 80 x 320 ft. with overhead monorail, story height 13 ft. 6 in., gable 23 ft., attached building 40 x 50 ft., story heights 15 ft. 6 in. and 13 ft. 4 in., has two No. 7 Whiting cupolas 72 in. in diameter. Contains equipment, ideal for mechanized operation, plenty dumping ground, built 1917, composition roof, vicinity population about 9000, near center of U. S. population, expect natural gas this year, served by two major railroads, water transportation available, city hydrant fire protection, land for expansion. Subject to withdrawal without notice. Address: Box 358, FOUNDRY, Cleveland 13, Ohio.

FOUNDRIES FOR SALE

IRON FOUNDRY with modern equipment for light and medium work. Capacity 20 molders. Good building. Land for expansion. Or will sell equipment only.

ALUMINUM & BRASS FOUNDRY. New building and equipment. Profitable operations. Priced low for quick sale.

EDWARD H. ZOLL
INDUSTRIAL PROPERTIES THROUGHOUT THE EAST

790 BROAD ST. NEWARK 2, N. J.

GRAY IRON FOUNDRY

Plant 25,000 sq. ft. plus 150,000 sq. ft. vacant land, completely mechanized overhead sand system. At present set up to produce 1,200 lengths 4" extra heavy soil pipe in 8 hour shift. Could be converted to magnesium or aluminum mass production. Will sell plant and equipment together or separately or will lease to responsible party. Reasonable terms arranged. Address: Box 468, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOR SALE

Most profitable medium size jobbing foundry in this section of the country. Well equipped, situated between Cleveland and Detroit. Arranged for production. Deal involves $250,000.00. Owners must retire. Opportunity for user of castings with certificate of necessity. Address: Box 340, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Small well equipped Western New York gray iron foundry; 4 tons daily capacity; building 45 x 100. Good labor situation. In active operation; $20,000, half cash. Address: LOUIS MARKS, BROKER, WOLCOTT, NEW YORK.

FOR SALE

Nonferrous foundry in large industrial town near Chicago. Capacity 2 ton aluminum and 2 ton brass per day. Have some government work. Price $50,000. Address: Box 395, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Modern gray iron foundry and pattern shop, 4 years old, capacity of 20 ton per day. Two buildings. Both fully equipped. Located in Virginia. Address: Box 462, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Gray iron foundry pouring five tons a day. Profitable operation. Manufacture products. $50,000 total sales price.

BOX 453
FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE

PANGBORN #33 MODEL MS BLAST CLEANING MACHINE, 7½' x 7½', with Type CH-2 Dust Collector Casing, late type semi-automatic; automatic reloading; constant filtering and separating; excellent condition; priced low skidded for shipment f.o.b. Cheyenne, Wyo.
UNITED AIR LINES, INC.
5959 SOUTH CICERO AVE. CHICAGO 38, ILL.

FOR SALE
IMMEDIATE DELIVERY

Ingersoll Rand, Chicago Pneumatic and Thor 1 x 8 portable grinders, Ingersoll and Chicago Pneumatic Chippers #2's & 3's. Write for price list.

SEATTLE PNEUMATIC TOOL CO.
535 ELLIOTT W. SEATTLE 99, WASH.

FOR SALE

1—1000 lb. Sklenar furnace, gas fired for brass complete with blower and 440 volt motor. Good Condition. Offer for sale due to diversity of alloys we must now run. Address: ROCK ISLAND METAL FOUNDRY, ROCK ISLAND, ILLINOIS.

FOR SALE—OIL FIRED FURNACE

1—Lindberg semi muffle box type furnace complete with controls, used very little. Size 42" high, 48" wide, 108" long. Air operated doors on each end. Address: Box 449, FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

MOLDING MACHINES
1—Tabor jolt rollover draw 40 x 50" table
1—Tabor jolt stripper 32 x 48" table
1—International Type R Portable 24 x 10
1—International Type F Stationary 26 x 8
2—Tabor Stationary Jolt Squeeze
1—Osborn 74W Plain Squeeze Portable
2—Osborn 75W Plain Squeeze Portable
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers
BLOWERS FOR CUPOLAS AND FURNACES
2—15 HP Spencer Turbine 2250 CFM @ 16-oz.
1—Connersville rotary 24 cu. ft. per rev. 6200 C.F.M.
Maxon-Premix Blowers for Gas ¼ to 1 HP
METAL MELTING EQUIPMENT
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired
New 32" to 41" dia. shell cupolas made to order.
TUMBLING MILLS AND SAND BLAST
1—Pangborn style GJ-1 rotoblast barrel complete with Pangborn style FM automatic loader. Load capacity approx. 16 cu. ft.
1—Pangborn No. 2 GH direct pressure type sand blast barrel, motor driven. Complete unit.
1—Pangborn Sand Blast Unit, including generator tank, shot cleaner, bucket elevator. Suitable for use with room
MISCELLANEOUS
1—#1 Blystone sand mixer, motor drive
1—#1-4 ft. Simpson mixer, motor drive
1—American Sand Cutter 72"
2—#16 Roto-clone units complete
1—Continuous Heat Treat Furnace 57' long, 1200° F. max.
25 Tons steel flasks in sizes from 26 x 26 to 60 x 60
4—Heavy Duty Flexible Shaft Grinders 2 HP
Complete stock of rebuilt mill and dust exhaust blowers
CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

4—#2 Johnston & Jennings jolt squeeze and pin lift molding machines, table 24 x 30, almost new.
1—Johnston & Jennings jolt pin lift, table 38 x 30.
12—assorted Tabor & Haynes molding machines, jolt and squeeze.
1—24 x 18 inch magnetic pulley with motor generator set.
1—4 x 8 Simplicity shakeout screen.
2—ladle carts.
1—Electric jib crane "Lo-Hed" 2 ton capacity direct current, type RD manufactured by A. E. Co., Philadelphia, Pa. Practically new.
BOX 469
FOUNDRY CLEVELAND 13, OHIO

FOR SALE

6—"G" Rollover Machines 20 x 8.
1—SPO Jolt Strip Squeeze Molding Machine.
2—Osborn J-75 Jolt Squeezers 10".
4—Tabor Jolt Squeezers 10".
1—Sprue Cutter with 2 HP. Motor.
1—North American Blower with 15 HP. Motor 2100 C.F.M., 16 oz pressure.
6—10" New—Haynes Jolt Squeezers.
6—12" New—Haynes Jolt Squeezers.
1—Chicago Pneumatic Air Hoist.
1—Osborn Molding Machine Model 342.
1—International Molding Machine HJ 16 x 6.
1—Arcade Jolt Strip Squeezer.
1—International Rollover Type R.
1—Chisholm & Moore Electric Hoist, 2 Ton Capacity.
1—Band Saw.
1—#400 Stroman Tilting Type Furnace, practically new. Complete with motor, blower, and burner, and new Crucible.
1—Hausefeld Tilting Type Furnace 250 to 300 lb. capacity, practically new.
1—#36 Osborn Core Draw Machine.
1—Lyon-Raymond Hyd. Lift Truck 2500 lb. capacity.
24—Adjustable Flask Clamps.
5—New, 1⅝" Osborn Vibrators.
300 Ft. of Good Used ¾" Air Hose in 30 to 75 ft. lengths.
10—New, Squeeze Valves and Handles and 10—New Jolt Knee Valves for Milwaukee Jolt Squeezers.
1—New, Eleanor Pyrometer, up to 1600°.
HAYNES FOUNDRY EQUIPMENT CO.
814 ADA STREET KALAMAZOO 52, MICH.

FOR SALE

Ruemelin Shot Blast Booth—10' x 10'. Down Draft Ventilation, Equipped with Shot Elevator and 1000 pounds generator. In excellent condition. Available in June.

PELTON STEEL CASTING COMPANY
148 WEST DEWEY PLACE
MILWAUKEE 7, WISCONSIN

For Sale

FOR SALE

We offer subject to prior sale the following heavy duty matched cast steel flasks with trunnions, condition like new:—

29 sets	19½ x 23½— 9"	cope, 4½"	drag
30 sets	19½ x 30½—10"	cope, 5"	drag
9 sets	41 x 56 — 8"	cope, 8"	drag
12 sets	38½ x 46½—11½"	cope, 5"	drag
13 sets	38½ x 39½—10"	cope, 5"	drag
2 sets	40 x 55½— 8"	cope, 8"	drag

Price .08 lb. F.O.B. grounds, Emmaus, Penna.

FOUNDRY DIVISION
GENERAL MACHINE CO., INC.
EMMAUS, PA.

FOR SALE

2—20" x 30' Belt Conveyors 5 H.P. motor 220/440V.
3—Elwell-Parker Gas-Electric Hi-Lift Platform trucks 1—3 ton, 2—5 ton cap.—good cond.
1—Plain Air Jolt Machine Johnston & Jennings 42" x 50" table.
3—22" x 32" Tabor Rollover Molding Machines.
2—#405-77 Osborn Rollover Molding Machines. —A-1 cond.
2—#2047-1 Osborn Hydraulic Draw Core or Molding Machines, Power rollover and air operated clamps. Used for Cylinder Head Production—Like new.
2—#147-1 Osborn Core Machine, Hand ram, Power rollover and draw—New.
3—#1000 Fisher Automatic Electric Tilting Nose Pouring Furnaces—A-1 cond.
1—#94 Osborn Core Blower—New.
1—Pangborn 28 cu ft. Type CK with Power Loader—Rotoblast.

Steel Flask Equipment:

100—19" x 26" 3" x 6" drag 4" cope
182—19" x 16" 3½" drag 4½" cope
30—17" x 27½" 4" drag 4" cope
16—20" x 35" 4" drag 4" cope
40—22" x 28" 4" drag 4" cope
47—14" x 30" 3 drag 4" cope—Sterling—New

All copes are barred

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.
15019 SARANAC RD. CLEVELAND 10, OHIO
TELEPHONE—GLENVILLE 1-1222

FOR SALE

Brown potentiometers—model 113661-x-19, 230 V, 60 cy, Range 550°-2000°F. Model 113661-x-53, 115 V, 60 cy, Range 0°-1200°F. $280 ea.

GEORGE KOCH SONS, INC.
10 SO. 11th AVE. EVANSVILLE, IND.

FOR SALE

22" x 26" Tabor sand blast barrel, 6" exhaust connection, ½" hose and valve. 60# air pressure. Direct motor drive. Address: SUPERIOR FOUNDRY CO., 151 W. HERSCHEL STREET, EAST PEORIA 8, ILLINOIS.

FOR SALE

One 4-ton capacity per hour suspended bottom, 4 ft. x 18 ft. I.D., Whiting Duplexing Furnace complete with 64 inch x 50 ft. steel stack and pulverized coal firing equipment. New condition, operated only 30 days. Price $10,000.00 F.O.B. our Chicago plant, including refractories now in unit. Present new price $24,000.00.

CRANE CO.
4100 S. KEDZIE AVENUE
CHICAGO 32, ILLINOIS

FOR SALE

500 Steel 16 x 16 x 14" Drags
200 Steel 16 x 16 x 7" Cope
150 ea. Steel Cope & Drag 18" x 20" x 8"
50 ea. Steel Cope & Drag 30" x 39" x 7"
50 ea. Steel Cope & Drag 17" x 26" x 9"
100 ea. Steel Cope & Drag 12½" x 14¼" x 5¼"
100 ea. Mal. Iron Cope & Drag 15½" x 15½" x 7"

HENRY FLIGELTAUB CO.
EVANSVILLE 5, INDIANA

FOR SALE

Simplicity Model LS 4 x 4. Semi-Portable Screening and Airating Unit #144-LSA-VM114. Purchased new in 1948—Good condition.

BOX 450

FOUNDRY CLEVELAND 13, OHIO

FOR SALE

American multitable Wheelabrator, serial #A55888, size #1 with 12-8" tables and complete electrical equipment, now in operation. New cost $4860.00, priced at $2200.00. 1—36 x 60 tumbling barrel with V belt drive, price $350.00. Address: WHITEWATER MANUFACTURING CO., WHITEWATER, WISCONSIN.

FOR SALE

1 American Sand Cutter, Type AA Size 6'-0" NW with 15 HP Motor, Volts 440, 3 Phase.

1—Style 900 GT Hausfeld Gear Tilting Cast Iron Pot for aluminum, blower driven by electric motor for use with natural gas. Brand new, has never been used.

We have the following flask equipment we will sell only as a lot, no single pieces: Hines aluminum heavy-duty pop-off type flasks, truss rods on side pieces, single pins, ¾" round. No jackets.

No.	Size	Cope	Drag	Pin Centers	Condition
1	24x48	12	12	50½	Excellent, slightly used
1	34x47	12	12	51½	New
1	36x36	12	12	40	New
1	42x42	12	12	46	New
2	12x24	6	6		Excellent
1	12x24	9			Excellent
2	12x24		9		Excellent
1	16x16	6			Excellent
1	16x16		5		Excellent
1	16x24		9		Excellent
1	16x28		9		Excellent
1	18x24	6	6		Excellent
2	18x24	9			Excellent
2	20x20	9	9		Excellent
1	20x20	12	12		Excellent

MEMPHIS CASTING WORKS INC.
1006 OAKLAND AVE. MEMPHIS 1, TENN.

FOR SALE

TUMBLAST CABINET, Pangborn model 1172A, ser. #7412911, Gravity Feed or Air Blast, 30" x 40" Barrel Model 2 GD1, 2.7 rpm. Uses sand or shot. Good condition. All motors A.C. $1250.00 fob.
SWING GRINDER, Mummert & Dixon 24 x 4. Excellent cond. $450.00 fob.
TABOR Portable Shockless Jarring Roll Over & Pattern Drawing Machine—24" x 16". $350.00 fob.
WORTHINGTON AIR COMPRESSOR L 47515. 17 x 13, single stage, double acting, non lubricated, 55# pressure, 912 CFM, D Belt Drive. Late model, no motor. $2000.00 fob.
WORTHINGTON AIR COMPRESSOR 9½ x 12, 40 hp AC motor & starter.
SULLIVAN AIR COMPRESSOR 11 x 10, 40 hp AC motor & starter.
MAGNETIC SEPARATOR, Dings Magnetic Separator—12" x 18"—110 v. s. ph. motor, 2 hp. Ser. R5771. $600.00 fob.
SAND BLASTING TANK, Pangborn model 1AV11. $150.00 fob.
SPHERICAL FURNACES, Romph—cap. up to 3000#.
Am., Model M. SAND CUTTER
Sly TUMBLING BARRELS
DEGREASING UNITS—all sizes
Royer SCREENARATOR
Lindbergh ATMOSPHERIC GENERATORS
FANS & BLOWERS up to 125,000 CFM
ELECTRIC FEED RAILS & TROLLEYS
CONVEYOR—all sizes and types
HOISTS—electric, hand, air—1 to 10 ton
CRANES—overhead & jib, all sizes
INDUSTRIAL VACUUM CLEANING units
GRINDING WHEELS—all sizes
MOTORS, SPEED REDUCERS, BLOWERS — any size
AIR COMPRESSORS—from 1 hp up
FOUNDRY EQUIPMENT. Send us your inquiries.

ALLIED MATERIALS HANDLING CO.,
4657 SPRING GROVE, CINCINNATI 32, OHIO

STACKING MACHINES FOR SALE

Practically new, used about 2 months, 2 International stacking machines. Type J8K-7, jolt, squeeze, pin strip molding machines. Also, approximately 1200—13 x 26 aluminum stack flasks and 160—15 x 29 aluminum bottom boards. Address: BROOKS FURNACE CO., ALBION, MICH.

FOR SALE

#1 Simpson bucket loader, 500 lb. sand capacity with legs extended 12 ft, suitable for refuse handling or loading core blower hopper. Address: VICTORIA METAL CO. INC., 2001 HAYBARGER AVE., ERIE, PA.

FOR SALE

Portable foundry core grinders. Limited number. Never used. Completely equipped, ready to operate with 220/440 v., 3 ph., 60 cycle motor, motor control and grinding wheel. Maximum working capacity 14 x 24. 18" diameter grinding wheel.

BOX 471

FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE
DETROIT ELECTRIC FURNACE

Model AA 1200 lb. capacity for cold melting, 2600 lb. capacity for duplexing. Complete with electrical breakers, buss bars, switch panel, transformers, compensators. Used approximately 9 months. This equipment is offered for sale as we have discontinued the type of work for which this furnace was purchased. Approximately $1200 worth of new linings and repair parts go with this furnace. Price $14,500.

NOBLESVILLE CASTING COMPANY, INC.
NOBLESVILLE, INDIANA

FOR SALE

1—Coleman Tower Oven, 27 carriers 84" x 25" Overall height of Oven 45', 9'8" long, 9'2" wide, Recirculating air type combination Oil and Gas fired—45 minutes to 180 minutes Baking Cycle Temperature 0 to 500 degrees Fahrenheit, New Condition.
1—Carl Mayer Tower Core Oven, 16 carriers 60" x 24", Overall height of Oven 25', 10'3" long, 7'9" wide, Recirculating air type combination Oil and Gas fired 0 to 20 minutes Baking Cycle, Temperature 0 to 500 degrees Fahrenheit. Good Condition.

REDSTONE INDUSTRIES, INC.
518 SECOND NATIONAL BANK BLDG.,
PHONE 8-3527
UNIONTOWN, PA.

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
3500	40 oz.	Spencer	60	440	1800
1000	32 oz.	Spencer	15	220	
225	10 oz.	Spencer	1	220/440	3600

PRESSURE BLOWERS (3 Phase, 60 Cycle)

8150/62500	Bishop & Babcock (40½x50 outlet)				
2500	7 oz.	Sturtevant	15	220/440	1800
2400	14 oz.	Mahr	15	220/440	3480
2300	1" SP	Clarage	3	220/440	1800
1800	1 in.	Sturtevant	2	220/440	
800	8 oz.	Nth.Amer.	3	220	3600
660	20 oz.	AllenBillmyre	7½	440	3600
450	6 lb.	A&B	30	220/440	3450
400	4.3 oz.	Spencer	2	220/3/60	3500
340	20 oz.	AllenBillmyre	3	440	3600
150	12 oz.	Nth.Amer.	1	220	3600

MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND, OHIO

FOR SALE

1—International type F jolt ram air turnover air draw molding machine, size 27" by 12" draw. Complete with air equalizers. Like new.
1—International type J-D-P jolt ram air power lift molding machine size 1200 lbs. x 10" lift. Stationary design. Like new.

WELLS MANUFACTURING CO.
7800 N. AUSTIN SKOKIE, ILL.

FOR SALE

SAND BLAST EQUIPMENT

Pangborn 21GK2 Rotoblast bbl. over $600 in spare parts—$3500.
Pangborn Rotoblast cabinet, type ES-213. Used for cleaning propeller blades. Price 30% of list.
Pangborn 1 GF-Tum-bbl. Good condition. Price $400.00.
Pangborn direct pressure tank, model AQI, like new $575.00.
Wheelabrator 6' air table $1500.00.
Pangborn Tumble Blast Barrels, Models 1GF Cap. 1 Cu. Ft; 2-GF 2½ Cu. Ft. Cap. Air type. Like new! Priced 50% of list.
Pangborn 9 LF, 9' plain Table, wheel type, used 1 year. Like new! Complete priced 50% of list.
Sand Blast Cabinets, generators, dust collectors and blowers. All kinds and sizes. Like new. 60% less list price.
Crane—2-ton, twin hook—21' span.....$400.00
Fork lift truck—1-ton $900.00.

DIAMOND SALES INC.
5654 W. JEFF. AVE.
DETROIT 9, MICHIGAN

FOR SALE

1—Sturtevant, ball bearing, multivane blower, size 8, with motor and V-type drive.
1—American blower, ball bearing, squirrel cage, size 6, with motor and V-type drive.

PLEASANT ELECTRIC COMPANY
1725-27 CENTRAL AVE. CINCINNATI 14, O.

FOR SALE

One used type NS, 10 lbs., 10 KW, Detroit Electric Furnace. Address: THE INVESTMENT CASTING CO., 319 CHESTNUT ST., NEWARK 5, N. J.

For Sale

FOR SALE

2—Model #712J Osborn jolt squeeze machines (practically new)
1—Model #93 Osborn core blower (very good condition)
1—Model #341 Farquhar belt type under car unloader. (Good condition)

THE NATIONAL SANITARY CO.
SALEM, OHIO

FOR SALE
SAND HANDLING EQUIPMENT

Consisting of shakeout receiving hopper 3' x 4' 6", reciprocating plate feeder, bucket elevator, steel collecting hopper with frame support, Clearfield #2 bucket loader 14 cu. ft. capacity, Clearfield #610 muller 14 cu. ft. capacity. Will handle 60 tons sand per eight hour day. Used one month. Address: NEPTUNE METER COMPANY, 192 JACKSON AVE., LONG ISLAND CITY 1, NEW YORK.

FOR SALE

2—Mummert Dixon Swing Frame Grinders, 16" and 22"
10—Walker-York & Monarch Coke Fired Stationary & Tilting Furnaces
6—Lupomatic Tumbling Barrels (3 wet, 3 dry)
10—1 Ton Open Top Worm Geared Ladles
1—International YPD—72" x 36" x 20"
4—Tabor Overhead Squeeze Molding Machines
4—Nicholls Jolt Squeeze 11F
30—Tabor Yoke Bar Plain Squeeze Molding Machines, Stationary
7—#275 JW Portable or Stationary Jolt Squeeze Molding Machines
All types of Cupolas, Blowers Positive Pressure & Centrifugal
Thousands of feet of various sizes of Roller Conveyors.
50 ton cast steel flasks like new.
Send us your inquiries Large Stocks

UNIVERSAL MACHINERY & EQUIPMENT CO.,
320 EAST BROAD STREET,
SHILLINGTON, PENNA. READING, PENNA.
R. B. HARRISON,
MANAGER FOUNDRY DEPARTMENT.
PHONES READING 30311—40146

FOR SALE

Two Whiting #7 cupolas. Serial 5072/5073, installed 1939, excellent condition.

WM. P. LAYTHAM & SONS CO., INC.
PATERSON, NEW JERSEY

FOR SALE
MOLDING MACHINES

4—International 20" x 8", Type G
1—Osborne Jolt R.O. #342
1—Jeffrey Sand Conditioner, Portable
1—B. & P. Stationary Sand Slinger
2—Chicago Pneumatic 1½ ton Air Hoists

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO., NOT INC.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

1—#92 Osborn core blower
1—#55 Demmler core blower
1—#610 Johnston & Jennings rollover
1—#602 Osborn rollover
A number of Hines aluminum flasks and jackets

BOX 463
FOUNDRY CLEVELAND 13, OHIO

FOUNDRY VIBRATING SCREEN

Stephens Adamson late model MD—very nice condition. V-belt driven by 5 HP motor; New $1400.00—Sell $695.00.

WM. R. SHIELDS CO.
G.M. BUILDING DETROIT 2, MICHIGAN

FOR SALE

Tabor molding machine, plain jar, power flask lift. 15" pattern draw, 600# cap. Will accommodate pattern plates from 12" to 20". Used only three months. Address: THE E. R. FROST COMPANY, INC., 1179—15th AVENUE S.E., MINNEAPOLIS 14, MINNESOTA. TEL. GLADSTONE 7966.

FOR SALE

#400 Stroman tilt crucible melting furnace, blower attached—oil fired. Address: Mr. M. T. St. Peter, Waterford, Connecticut.

FOR SALE

2 USED #1 DEMMLER CORE BLOWERS
$350.00 EACH
COMPLETE WITH EXTRA PARTS

AK-SAR-BEN MANUFACTURING CO.
4520 SOUTH 36TH ST. OMAHA, NEBRASKA

FOR SALE

1—#31 Ransom Grinder 20" to 16" dia. wheel 1190 RPM Spindle 5 H.P. Motor.
1—#61 RW Ransom Grinder 20" to 16" dia. wheel 1130 RPM Spindle 5 H.P. Motor.
2—#72 RW Ransom Grinder 24" to 20" dia. wheel 1035 RPM Spindle 7½ H.P. Motor.
1—#2 Shuster Power Sprue Cutter 8" Capacity ¾" Sq. Brass Belt Driven.

BOX 443
FOUNDRY CLEVELAND 13, OHIO

NONFERROUS FURNACE

Stroman manual tilt furnace, model OH, crucible size #125, 150, 175. Oil fired. This furnace was used for less than 20 heats. Date of manufacture shown on manufacturer's plate—September 26, 1950. Can be demonstrated in operation.

ROBERT KINSLEY
R D 8 YORK, PA.

FOR SALE

Wheelabrator cabinet 21'9" long, 10' high, 3 Wheelabrator wheels, 20 Horse Power for each wheel. Cabinet designed to shot peen aircraft engine master rods. Price $5000.

CONSOLIDATED ELECTRIC & AIR PUMP CO.
141 MANGIN ST. NEW YORK 2, N. Y.

FOR SALE

BLOUNT PATTERN MAKER'S WOOD LATHE 16" swing, 6-ft. bed, 2 H.P., 550 volt, 60 cycle, 3 phase motor in headstock with controller for 8 speeds; magnetic starter, tripod and standard equipment. In new condition. Only $1250.00 net cash, fob our plant. This lathe is available due to the discontinuance of our pattern making department.

GILBERT & BARKER MFG. COMPANY
WEST SPRINGFIELD, MASS.

FOR SALE

2—Osborn Jolt, Squeeze, Rollover, Draw Molding Machine
1—Besly 53" Surface Disc Grinder
Complete Steel Converter Production Equipment.
1—Schneible Multi-Wash Dust Collector for 5,000 CFM.

GUNITE FOUNDRIES CORPORATION
ROCKFORD, ILLINOIS

TUMBLING BARRELS

1—Whiting 4-ft. diam. 6-ft. long
1—Whiting 30" x 9-ft. long
(Complete with countershafts)

FAIRBANKS, MORSE & CO.
ST. JOHNSBURY, VERMONT

MOLDING MACHINES FOR SALE

4 machines—Osborn—style #331—table length 30", squeeze cylinder diameter 13"—all machines in good condition. Interested parties contact:

MR. FRED GOERKE, Plant Superintendent
STANDARD BUFFALO FOUNDRY INC.
743 HERTEL AVE.
BUFFALO 7, NEW YORK

FOR SALE

Cupola charger complete—including weigh hopper, transfer car and 60" cone bottom bucket. Also #8 Whiting cupola, 9000 C.F.M. Roots positive blower.

AUBURN FOUNDRY, INC.
AUBURN, INDIANA

FOR SALE

Model "M" 89/70 American Wheelabrator sand cutter. Excellent condition—less than two years old. Price $5800.00. Available immediately. Contact: MIDWEST FOUNDRY COMPANY, DIVISION of L. A. DARLING COMPANY, COLDWATER, MICHIGAN. PHONE 1100.

For Sale

FOR SALE

The equipment listed is almost new and priced to sell!!

1—Osborn Type 405-77 jolt rollover and pattern draw—size—64" x 50"—with runout car.
6—Osborn type 2047—jolt rollover and pattern draw—size—24" x 24".
2—International clamp and draw—76" x 9½" draw.
1—Kane and Roach core wire straightener—No. 5 DX-⅜" capacity.

All equipment can be inspected at our warehouse and immediately available.

GLOBE TRADING COMPANY
1817 FRANKLIN STREET
DETROIT 7, MICHIGAN
PHONE: WOODWARD 1-8277

SAND BLASTING EQUIPMENT
FOR SALE

Pangborn 6' rotary turn table suction type "LE" complete with two norbide nozzles, electric motor—price $850.
Pangborn 6' direct pressure cabinet table with 2AQ4 abrasive generator 7BVR abrasive separators, 2 H.P. elevator conveyor dust collector, designed for shot peening or straight flat work—price $1000.
Pangborn suction cabinet type NE2 5' x 3'—price $225.
Pangborn suction cabinet 3' x 4'—price $200.

M. ELSTEIN
141 MANGIN ST. NEW YORK 2, N. Y.

FOR SALE

1—General Electric-Ingersoll-Rand cupola blower 4200 CFM capacity at 16 oz. pressure complete with G. E. direct connection 60 cycle, 440 volt, 3 phase, 31.9 H.P. motor. Newly rewound.
1—General Electric 50 HP Induction slip ring motor—1200 R.P.M. 440 volt—60 cycle—3 phase 67.5 amps—with starting control.
1—B. F. Sturtevant Co. #7 blower only.

AMERICAN ABRASIVE METAL CO.
IRVINGTON 11, NEW JERSEY

FOR SALE

One (1) Gardner disc grinder 54" No. 24 horizontal with motor and grinding wheel.

STILLMAN FOUNDRY COMPANY
1927 WILL AVENUE N. W.
GRAND RAPIDS 4, MICHIGAN

FOR SALE

2—Osborn #332-38 Jolt Squeeze Rolover Draw
3—Osborn #601 Jolt Rollover Pattern Draw Machines
2—Osborn #602 Jolt Rollover Pattern Draw Machines
2—Osborn #712 Jolt Squeeze Pin Lift Machines Never Used.
2—Tabor Portable Jolt Rollover Pattern Draw Machines 30 x 40 Tables
2—International Jolt Rollover Pattern Draw Molding Machines—Portable Type
2—International Type F, 27 x 16 Heavy Duty Jolt Rollover Pattern Draw Molding Machines in service 18 months.
6—Hand Rollover Core Machines, 20 x 8, 22 x 12, 18 x 8.
1—American late model gasoline power driven sand conditioner. Like new.
1—Jeffrey sand conditioner. Excellent condition.
All equipment immediately available.

BOX 439
FOUNDRY CLEVELAND 13, OHIO

FOR SALE

1—International type JDP jolt ram power lift molding machine, lift capacity 1600 lbs. to 10 inches, lift pins length 23" centers, width adjustable from 27" to 37", Serial #600237-3-5. This machine has seen very little use and is in as good as new condition. Price for immediate sale $1500.00. Address: WHITEWATER MANUFACTURING CO., WHITEWATER, WISCONSIN.

NEVER USED AIR TOOLS

Chicago Pneumatic, Ingersoll-Rand, Thor, Cleco—far below list prices. Send for inventory and price list. ADDRESS: HAYNES EQUIPMENT CO., INC., 144 FULTON ST., NEW MILFORD, N. J. PHONE ORADELL 8-2683.

FOR SALE

Lectromelt UT furnace, A-1 condition, hardly used, now stored. Address: Box 482, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

For Sale

HEAVY DUTY MOLDING MACHINES

1—Osborn #405-77 Jolt Rollover Pattern Draw with Oil Leveling Runout Car—Used 18 months.
1—Davenport Heavy Duty Model #48-SA Jolt Rollover Pattern Draw Machine—Used 4 months.
2—Osborn #403 Heavy Duty Jolt Rollover Pattern Draw Machines—Two years of service, excellent Condition, Low Price.
2—Osborn #560 Jolt Strippers—Like New.
All above machines for immediate delivery.

BOX 437
FOUNDRY CLEVELAND 13, OHIO

FOR SALE
HERMAN ROLLOVER &
JARRING MACHINES

6000 lb. capacity—table 50" x 80"
3000 lb. capacity—table 30" x 60"
International 12" cylinder PKL Jolt, Strip, & Squeeze Machines
International 12" cylinder LJS Jolt Squeezers
Osborn—Model 721 J Jolt Strip Squeezer
Also Core Grinder, 7½ HP Marschke Snag Grinder, 54" Besly Horizontal Disc Grinder, Yale 6000 lb. Hi-Lift Platform Truck, Transite Core Plates
These machines are priced for immediate disposal.

BALCHER MACHINERY COMPANY
1884 S. COMPTON ROAD
CLEVELAND HEIGHTS 18, OHIO

FOR SALE

1—Wardwell model HC bench type motor driven automatic hack and band saw grinder w/bench type motor mounting and ½ HP motor for 110/60/1 phase current. Very good condition. Address: ACME BRASS & ALUMINUM FOUNDRY, MARSHALLTOWN, IOWA.

For Sale

FOR SALE

2—#1 Conveyors with EE Feeder
11' long Conveyors with 20" Wide Belt equipped with 1 HP motor with Geared Head Speed reducer (belt speed 24 F.P.M.)
2—#2 Conveyors with A-A Tempering
36' long Conveyors with 20" Wide Belt equipped with 3 HP motor and magnetic head pulley 18" in diam., 24" wide (belt speed 150 F.P.M.)
2—#3 Conveyors B-B
20' long Conveyors with 20" Wide Belt equipped with 2 HP motor (belt speed 150 F.P.M.)
2—#4 Conveyors
93' long Conveyors with 20" Wide Belt equipped with 3 HP motors and 4 Plows (belt speed 150 F.P.M.)
Above new, never been used—Manufactured by the Trowbridge Co., Clifton, N. J.
27 Lengths (18' to 27' long) 6" Reinforced Louden Tracks, plus 10 Truck Units to match. *Like New.*
1—#4 Whiting Cupola, D Section only, complete except stack. New—never set up.
2—Simplicity Shakeout Machines (3' x 5') complete with motors, pulleys & V Belts, and including 12' Screw Conveyor with reducing drives. *Like New.*
1—Plain-Jar, Power Draw Type Machine with adjustable flask lifting pins, Serial No. 28144. *New*

If you contemplate modernizing your foundry here is an opportunity for immediate delivery, plus a substantial savings.

SERVICE FOUNDRY, INC.
330 N. ROCK ISLAND AVE.
WICHITA, KANSAS

PHONE 3-1242

CLASSIFIED ADVERTISING RATES

POSITION WANTED—Minimum advertisement set solid, 30 words or less, $2.50. Additional words 9c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $5.00. Additional words 15c each.

NOTE—If replies are to be sent to a box number in care of THE FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Twelve Times
1 inch	$ 15.00	$ 13.75	$ 12.50	$ 11.25
2 inches	27.00	25.00	23.00	21.00
3 inches	40.00	36.50	33.50	30.00
4 inches	50.00	46.00	41.50	37.50
5 inches	60.00	55.00	50.00	45.00
6 inches	73.50	66.50	60.00	53.50
7 inches	82.50	75.00	67.50	60.00
8 inches	91.50	83.50	75.00	66.50
1 column	110.00	100.00	90.00	80.00
Half Page	162.50	150.00	137.50	125.00
Full Page	275.00	250.00	225.00	200.00

Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

Penton Building, Cleveland 13, Ohio

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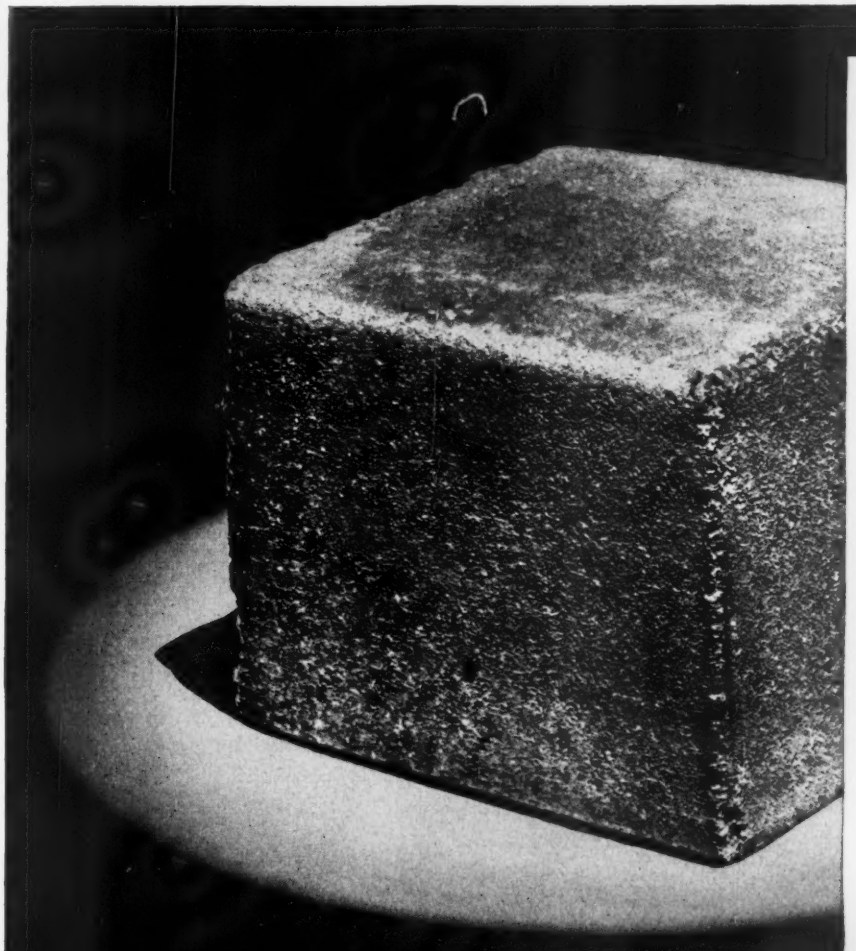
Providing Effective Deoxidation IN THE CUPOLA



FERROCARBO Briquettes are made from silicon carbide specially processed for metallurgical use and developed by The Carborundum Company as a cupola addition. Readily soluble in molten iron, a most effective deoxidizing action results.

Super-heated iron of greater fluidity is produced. Cleaner, sharper castings are poured. Foundry variables are lessened.

To obtain immediate, authoritative information...

Write or Phone our

FERROCARBO Distributors

KERCHNER MARSHALL & CO.
PITTSBURGH
Cleveland, Birmingham, Philadelphia and Buffalo

MILLER AND COMPANY
CHICAGO
St. Louis and Cincinnati

FERROCARBO Briquettes

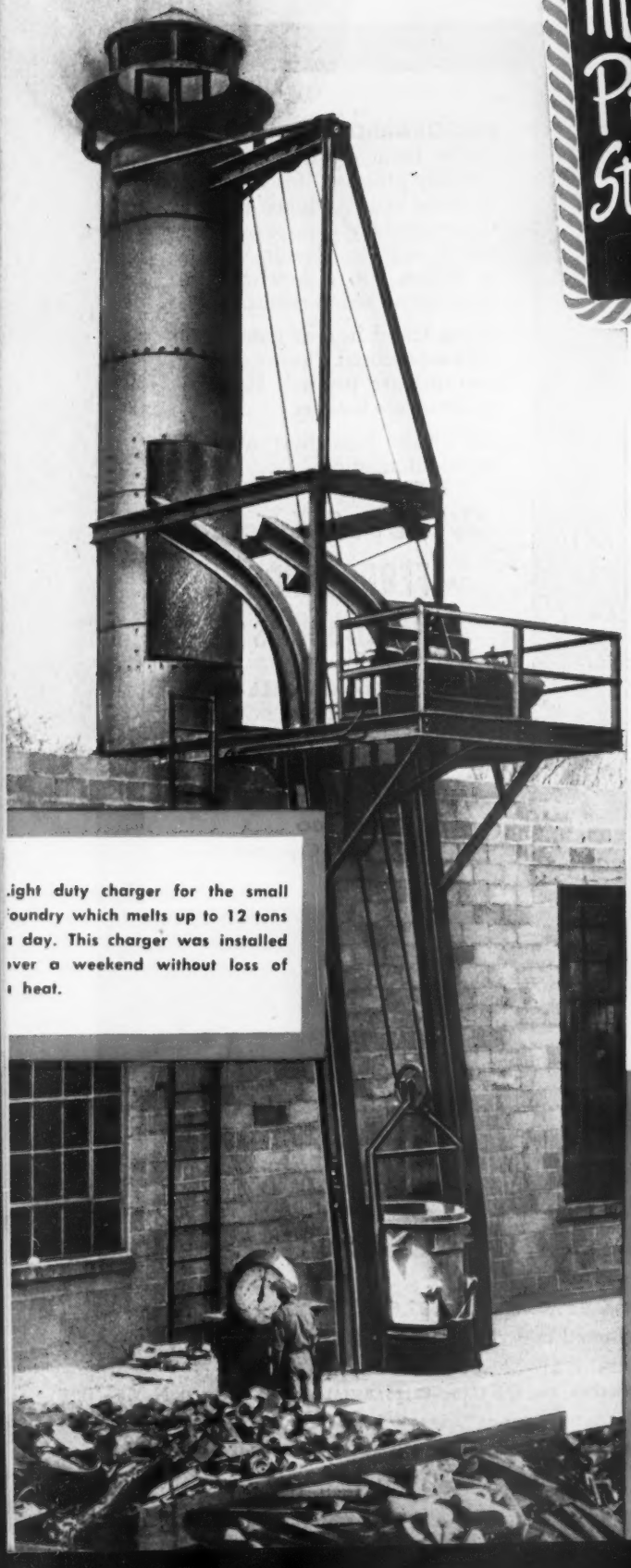
BY **CARBORUNDUM**
TRADE MARK

● **FERROCARBO Briquettes** are manufactured under U.S. Patents 2,119,521 and 2,497,745. The process of making cast iron through utilization of silicon carbide is registered under U.S. Patent 2,020,171.

Made in Canada by the CANADIAN CARBORUNDUM COMPANY, LTD., Niagara Falls, Ontario
and Distributed in Canada by WILLIAMS & WILSON, TORONTO, Montreal and Windsor, *and by* KERCHNER, MARSHALL & CO., BUFFALO, N. Y.

"Carborundum" and "Ferrocarbo" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N. Y.

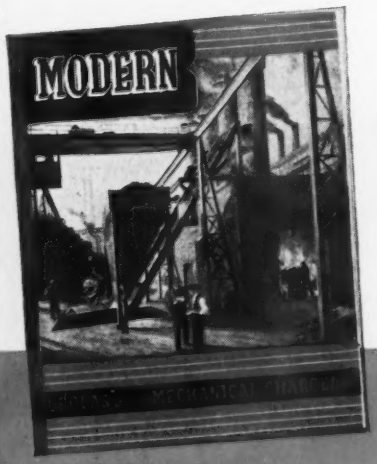
SCALING DOWN CHARGING COSTS...
and making up a charge at the scale...
are figured over two standard formulas...



ight duty charger for the small oundry which melts up to 12 tons a day. This charger was installed ver a weekend without loss of a heat.

equal greater over-all profits when charging is done mechanically.

Relieved of much back-breaking work fewer yard-men are needed to control the automatic charging equipment. And through closely WORKING TOGETHER with practical foundrymen MODERN engineers have developed this moderate-priced charger specially for the small foundry. Hotter, more uniform metal reduces the volume of waste. Fewer lost time accidents help to keep men on the job. For all the facts and figures on this type of charging, for the small foundry, write for catalog 147-A.



Complete information on cupola charging will be mailed, along with catalog 147-A, to foundry executives who outline a problem on their company letterhead. Use the coupon for catalog only.

MODERN EQUIPMENT CO.
PORT WASHINGTON, WISCONSIN

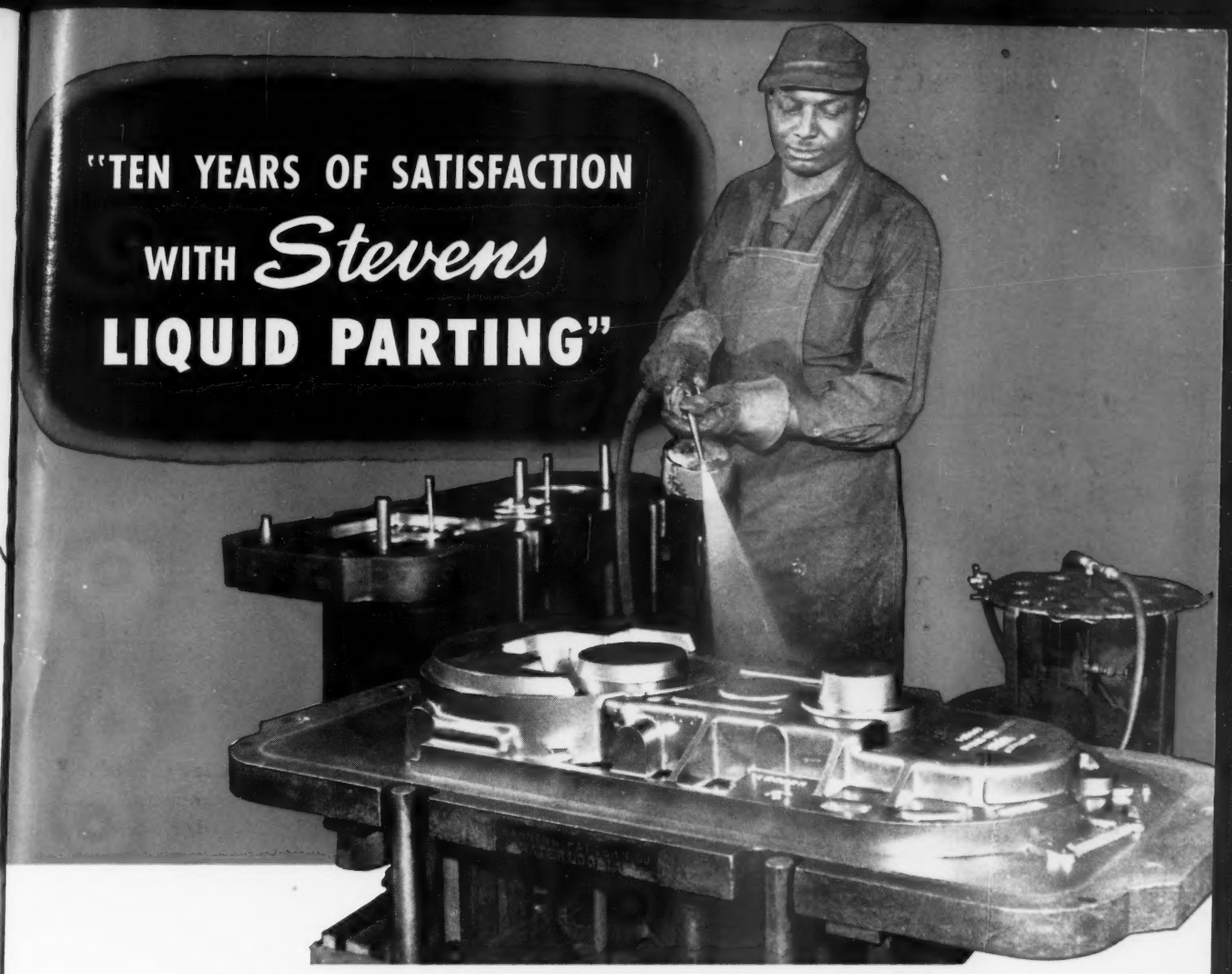
Mail catalog on cupola charging.....147-A ☐
Crane & Monorail Catalog.....150 ☐ Ladles 149 ☐
Pouring Systems and Modern Pouring Devices.....☐

Company.....

Street.....Zone.....

City.....State.....

Individual



REPORTS THE OLIVER CORPORATION

Listen to this report from a long-time Stevens' customer—The Oliver Corporation, a user of Stevens Liquid Parting at its South Bend plant: "This type of parting has been in use at our plant for the past ten years," writes Fred N. Davis, foundry superintendent. "During this time we have had numerous opportunities to compare it with competitive makes. We have found that Stevens Liquid Parting does a better job of keeping *all* types of patterns clean and life between applications is longer than that of competitive brands. It also has a distinct advantage when used on patterns having a deep draw problem."

There you have the word of an expert—based on actual experience in meeting problems of foundry operation. Why not see for yourself just what Stevens foundry facings and supplies can do for you? Call in your nearby Stevens representative today and let him tell you about the complete Stevens Line. Or, if you prefer, write direct to *Frederic B. Stevens, Inc., Detroit 16, Michigan* for full details.

- PLUMBAGO
- CORE PASTE
- LIQUID PARTING
- CORE AND MOLD WASH
- DRY PARTING
- MUDDING COMPOUND
- PITCH CORE COMPOUND
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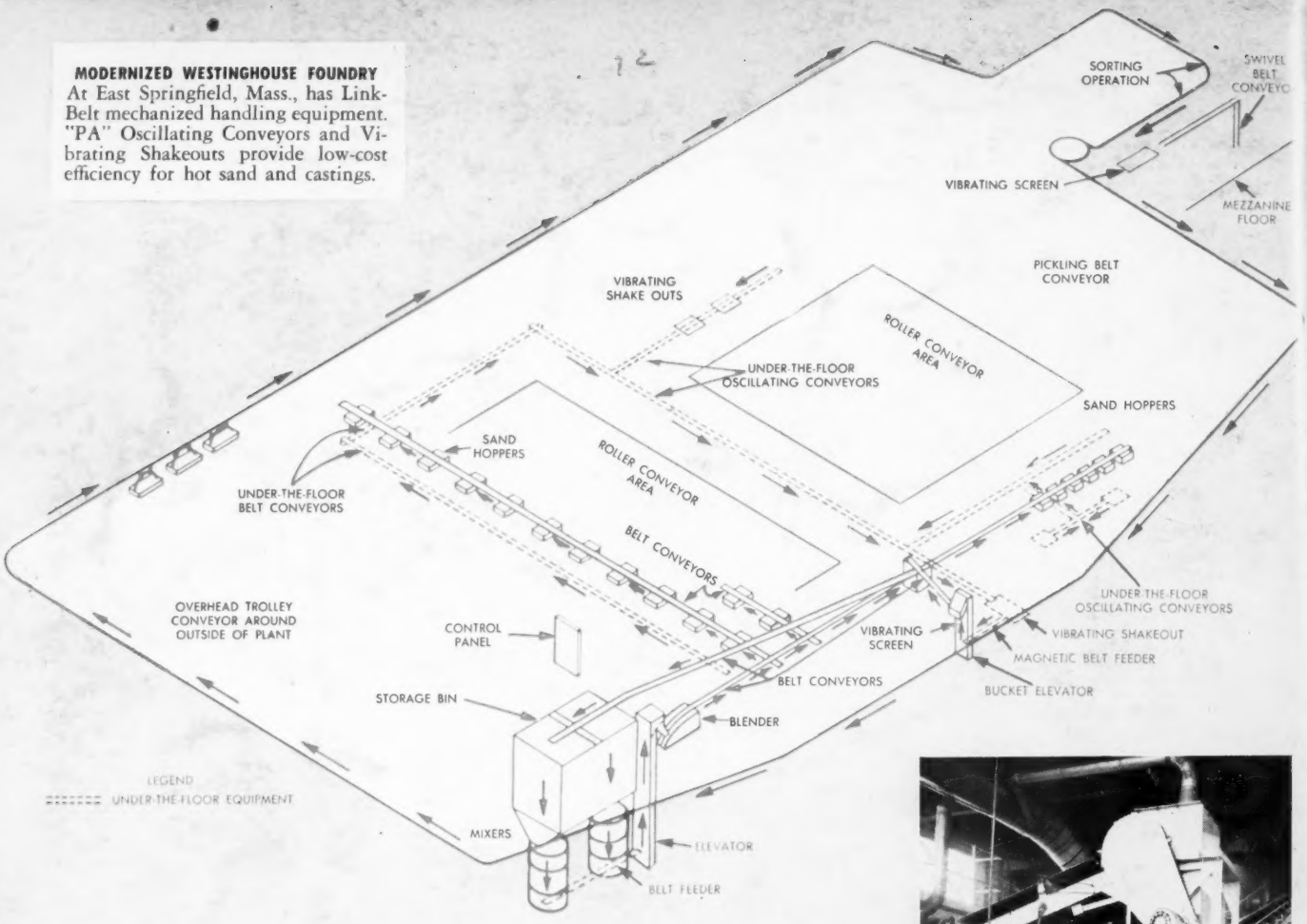
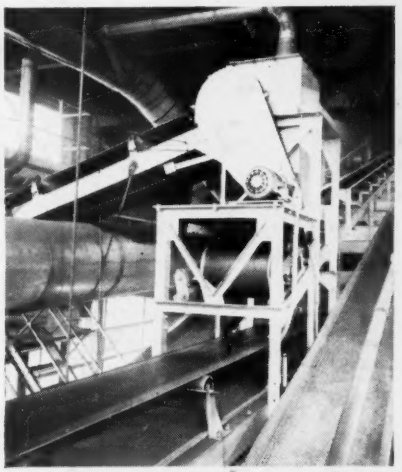
MODERNIZED WESTINGHOUSE FOUNDRY At East Springfield, Mass., has Link-Belt mechanized handling equipment. "PA" Oscillating Conveyors and Vibrating Shakeouts provide low-cost efficiency for hot sand and castings.



Boosts melt 67%

cuts manual lifting 80%



Three of twelve Link-Belt sand handling Belt Conveyors providing smooth-rolling high capacity in modularized Westinghouse foundry.

Outside building, 600 ft. L-B Overhead Trolley Conveyor, cools and moves castings to sorting, keeps heat out of foundry.

LINK-BELT mechanized sand and castings handling equipment pays double dividend in modernized Westinghouse foundry

Greater capacity in the same building . . . at lower cost. Improved working conditions and less labor turnover. Better control of casting quality. Westinghouse Electric Corp. achieved all these recently when they modernized their East Springfield (Mass.) foundry.

And, like so many other foundries, they came to Link-Belt for the latest in mechanized sand and casting handling equipment. Link-Belt engineering experience and superior equipment has paid off for Westinghouse from the first day on.

They now melt 100,000 lbs. of gray iron in one shift, compared to the former 60,000 lbs. Working conditions are so improved they can attract the right kind of labor. Manual lifting has been reduced from 1470 to 294 tons per day . . . and air is completely changed eight times an hour.

You, too, can keep step with the quickening tempo of today's production by calling in Link-Belt to help plan your foundry mechanization. Our specialists will work hand-in-hand with your consultants.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

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